INSIDE: FISHING TIPS FROM MASTER GUIDES

Montana Outdoors

MONTANA FISH, WILDLIFE & PARKS | $3.50

MAY–JUNE 2019

SURVIVOR

After 70,000,000 years, paddlefish are still swimming strong

IN THIS ISSUE:

VENISON CURRY
THE UPPER CLARK FORK REBORN
A MOSQUITO'S WORST NIGHTMARE
WORKING THE NIGHT SHIFT AT FRESNO

Montana Outdoors

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Montana Outdoors

MAY–JUNE 2019

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A REST BETWEEN STAGES A newly emerged adult dragonfly rests on a limb near Hebgen Lake. Learn more about these amazing insects on page 16. Photo by John Juracek.

FRONT COVER They somehow survived the Paleozoic, Mesozoic, and Cenozoic eras, even as dinosaurs went extinct. See page 10 to learn how Montana's prehistoric paddlefish are faring in today's Holocene era. Photo by Eric Engbretson.

Parks article hits home

I want to congratulate you on the excellent article on Montana's state park system ("Behind the Curtain," March-April 2019) and the troubles it faces. I especially appreciated the graph titled "More parks, less funding" showing how vastly underfunded our parks are compared to those in neighboring states. I will be contacting my government representatives to urge correction of this problem.

Peggy Walker
Missoula

Behind the Curtain

Montana's state parks system is struggling, even as employees do all they can to keep sites clean, accessible, and enjoyable.

BY TOM DICKSON

Thank you for "Behind the Curtain," which let us clueless members of the public in on the daily struggles that state park workers endure due to the lack of adequate financial support. People now know that a very, very thin line of workers keep Montana's state parks open for their enjoyment.

And thanks for including the "Indispensable" essay (Sketchbook). Office managers and administrative assistants rarely are noticed, and yet they are an essential part of FWP state parks and other programs. It was good to see you praise their knowledge, which keeps office workloads flowing and the general public informed and happy.

Delores Benner
Citrus Heights, CA
(born and raised in Montana)

> **People now know that a very, very thin line of workers keep Montana's state parks open for their enjoyment.**

The March-April issue presents serious issues for your State Parks Division and Fishing Access Site Program. One can't help but feel sorry for park managers who have to deal with large staff shortages and extremely high visitor use. An increase in the Parks Division budget is long overdue.

As for fishing access sites, they are overcrowded with people who aren't paying their fair share. I lived in Montana long ago and had the good fortune of experiencing rivers and lands without the crowding.

Dennis Hanson
Merrifield, MN

Others need to pay, too

Your article on FWP's fishing access sites (FASs) succinctly detailed the challenges that Montana's FAS program experiences from overuse and underfunding. Unfortunately, the article missed the mark. Simply renaming fishing access sites does nothing to solve the cost issues you list as "fencing, roads, parking areas, trash pick up, ramp repair, caretaker services, and general maintenance..."

It is time that FWP begin requiring all users of fishing access sites to pay their fair share. As an avid angler and hunter who purchases licenses every year, I'm increasingly frustrated watching FAS use escalate while only a small percentage of users actually contributes to them. When FWP needs to double "the number of latrines and dumpsters," as you write, that's rarely from increased angler use. Typically, it stems from other people crowding sites and using them for launching inner tubes or just lounging around.

The solution is simple: Anyone without a valid fishing license who uses an FAS should be required to purchase some form of FAS "pass." There are several examples of this system already in use in other states. Your magazine missed a terrific opportunity to initiate the truly important discussion of how all FAS users should help fund the program.

John Herzer
Blackfoot River Outfitters
Missoula

Have something to say?

We welcome all your comments, questions, and letters to the editor. We'll edit letters as needed for accuracy, style, and length. Write to us at Montana Outdoors, PO Box 200701, Helena, MT 59620-0701. Or e-mail us at: tdickson@mt.gov

"Just the bait, please."

LIANA FINCK/THE NEW YORKER COLLECTION/THE CARTOON BANK

Venison Curry

By Tom Dickson | Preparation time: 30 minutes | Cooking time: 30 minutes to 2 hours | Serves 6

SHUTTERSTOCK

When I first began dating my future wife, we spent a lot of time hanging out at her parents' home. Her father, a doctor who immigrated to the United States from Burma (Myanmar) in the late 1950s, had recently retired. For recreation, he liked to cook Burmese cuisine, which is influenced by Chinese, Indian, and Thai dishes. On Saturday nights after Lisa and I returned to her parents' home from a movie or concert, we'd be hit with the welcoming aroma of cinnamon, coriander, ginger, turmeric, cloves, and more from dishes like biryani or beef curry. A big bowl would be left out for the two of us.

After we moved to Montana, I set out to re-create that scrumptious curry, using venison rather than beef. I experimented but could never quite capture the taste of what I remembered. Finally I hit upon the right mix of ingredients that transported me back to that aromatic kitchen.

The ingredients list is long, but don't be deterred. All items are available in most Montana grocery stores. And the cooking process is easy: Brown the meat and onions, add everything else, then stick the pot into the oven for a few hours. Pay bills or watch TV while it cooks.

This recipe is a great way to use venison neck meat, shanks, and the sinewy portions of the shoulder. These cuts contain collagen and connective tissue that break down and make the meat fork-tender during the slow, moist, low-heat cooking process known as braising. If using beef, the best cut is a chuck roast.

If all you have in the freezer are venison steaks and roasts—which usually come from the hindquarters—you can still make this dish. Simply cook it hotter and faster. It won't be as good as with a slow braise, but it will still be delicious.

—Tom Dickson is editor of Montana Outdoors.

INGREDIENTS

- 2–4 T. vegetable oil
- 2 lbs. venison stew meat (from the neck, shanks, or shoulder) or beef chuck, cut into 1-inch cubes, patted dry with paper towels, and liberally seasoned with salt and pepper
- 2 large onions, chopped
- ⅓ c. curry powder
- 2 T. mustard seed
- 2 large garlic cloves, minced or crushed
- 1 t. ground turmeric
- 2 large cinnamon sticks
- 6 whole cloves
- 1 bay leaf
- 1 (28 oz.) can chopped tomatoes
- 2 c. beef broth
- 2 T. minced jalapeño peppers
- 2 T. minced fresh ginger
- 1 (14.5 oz.) can garbanzo beans, drained
- Optional: 1½ c. whole milk, ½ c. chopped peanuts, ¼ c. shredded coconut
- Cooked white rice

DIRECTIONS

Preheat oven to 300*.

In a large Dutch oven or other oven-safe pot, heat vegetable oil and brown meat in batches. Remove meat.

Brown onions for 7 minutes. Return meat to pot.

Add curry, mustard seed, garlic, turmeric, cinnamon sticks, cloves, and bay leaf. Cook while stirring for 1 minute.

Add tomatoes, broth, peppers, and ginger. Bring to a boil. Place in oven and bake for 2 hours*.

Remove from oven. Stir in beans and (if using) milk. Serve over cooked white rice, with (if using) coconut and chopped peanuts sprinkled on top. ■

**If using venison roast or steak meat, increase temperature to 375 degrees and cook for only 30 minutes.*

FWP's constant balancing acts

Everyone strives for balance. Throughout each day, we balance civic duty with home responsibilities, expenses with income, and family needs with the needs of others. It's as though we walk around all day with arms outstretched and a scale in each hand, adding and subtracting components—time, money, energy—from each side in an effort to find a fair and sustainable equilibrium.

Not surprisingly, balance is also central to how Montana Fish, Wildlife & Parks manages the state's wildlife, state parks, and fisheries.

In fisheries management, for instance, we're challenged to balance dual mandates of protecting native species like westslope cutthroat trout while providing fishing recreation, often with nonnative species like walleye, brook trout, brown trout, and rainbow trout. On the Madison and other rivers, we have to balance the needs of local anglers, outfitters, and landowners, all while protecting habitat and fish populations. At fishing access sites, we consider what anglers want as well as the desires of other people—kayakers, rafters, dog walkers, bird watchers, school groups—who use these public recreation areas.

One of FWP's many balancing acts involves managing native and non-native fish species. FWP needs to provide abundant fishing recreation, which often makes use of non-native species such as brook trout (lower fish in photo). Yet the department must protect the state's natural heritage by conserving native species like westslope cutthroat trout (upper fish).

In our state parks, we're constantly balancing the need to do emergency stopgap electrical and sewage line repairs with more costly, but smarter solutions to upgrade those systems. We continually balance the diverse needs of state park visitors—from people who want a quiet, no-frills getaway to those in RVs who expect amenities like concrete pads and electrical hookups. We balance park guests' desire to experience the outdoors and learn about Montana's history and geology with our responsibility to protect resources such as pictographs and subterranean caverns for future generations.

As we manage wildlife, we're constantly balancing human concerns against those of wildlife and habitat, whether it's grizzly bears, elk, deer, golden eagles, or sage-grouse. In mountain lion and wolf management, we aim to balance those predator populations with populations of elk, deer, and other prey. Whenever we set hunting seasons, we balance human requests for more hunting opportunities with the need to conserve game populations.

We also balance how much time our biologists spend on game species relative to nongame species. We balance the concerns of landowners who have overabundant elk eating crops and damaging property with the concerns of hunters who want more elk. We weigh the needs of archery hunters and rifle hunters, hunters and other recreationists, resident hunters and nonresident hunters—the list of balancing acts we perform each day is endless.

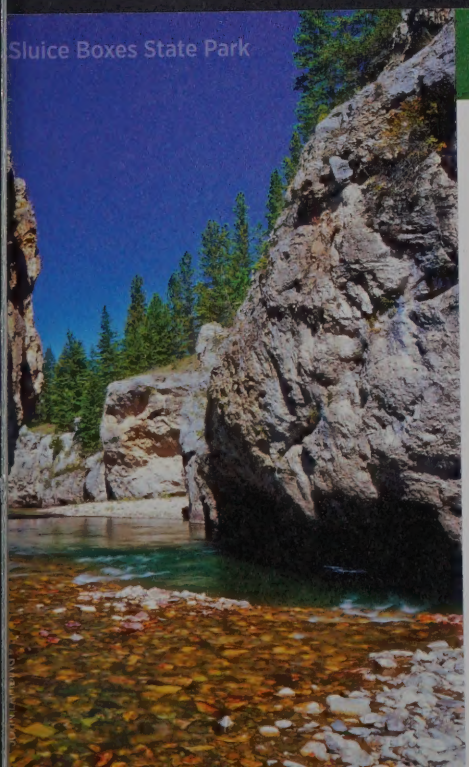
Balancing priorities means that not everyone gets everything they want. That's okay. We've found again and again that the most sustainable results come when biologists, irrigators, conservationists, loggers, hunters, ranchers, anglers, miners, land managers, and others work together to arrive at a fair balance of each others' needs and concerns. Balance requires a lot of empathy and compromise.

One example is the Three Rivers Collaborative. It began last year when FWP started working with local governments, businesses, and nonprofit groups to improve public communication about health and recreation issues on the Bitterroot, Blackfoot, and Clark Fork Rivers. The effort, based on balancing a wide range of interests, "already is building trust among the various partners and a common understanding of the various issues and wide-ranging values concerning these three rivers," Randy Arnold, FWP's regional supervisor in Missoula, recently told me.

As stewards of the public trust and so many outdoor experiences, our job is to find and create balance through sound management based on both natural and social sciences. As long as they protect the quality of what we all love about Montana, we believe that those balancing acts, hard as they may be to achieve, are ultimately in everyone's best interests.

—**Martha Williams**, Director, Montana Fish, Wildlife & Parks

PATRICK CLAYTON/ENGBRETSON UNDERWATER PHOTOGRAPHY



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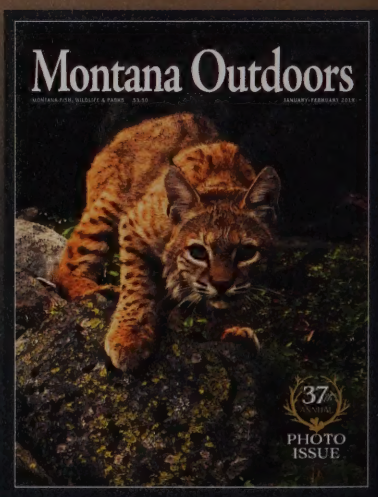

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JOHN WARNER

HIGH-TECH TROUBLESHOOTER

NATALIE FINNEGAN
Network Systems Analyst, Billings

I've worked at Montana Fish, Wildlife & Parks for 22 years, but I didn't start out in the information technology field. I earned a B.S. in biology at Montana State University and was considering graduate school when I got a job with the Parks Division at the FWP regional office in Bozeman in 1996. Later that year, I transferred to the Billings regional office and worked in the front office, where I began doing some IT support work. As technology became more prevalent in the workplace, I started attending training sessions, and in 2005 I became the department's Region 5 network systems analyst. I have no plans of retiring any time soon.

Like FWP's other 11 network support staff, I set up new computers and printers, fix hardware problems and software errors, troubleshoot servers, and work on smartphones, tablets, GPS devices, cameras, and all the other new devices and equipment that FWP employees use in the office and the field. All of us also work on cybersecurity issues as they arise, and we help with FWP's Automated Licensing System in our respective regions.

What makes our IT positions so interesting is that we support such a wide range of dedicated FWP employees, from field technicians to senior department managers, all with different IT needs. We might help wardens with their vehicle radios, body cameras, and Toughbook computers, while wildlife or fisheries biologists might need support setting up a system to download GPS coordinates on radio-collared mule deer or tagged sauger. Our phones are constantly ringing from staff needing assistance, and providing them with top-notch customer service is a big part of our job satisfaction.

Montana photographer **Bill Kinney** specializes in whitetail bucks and has seen his images on the covers of dozens of hunting magazines. But when he spotted this wild turkey drinking water at a fountain in a neighbor's yard, he could not resist. "That's in the North Hills above Helena. It's real arid up there, and there was a flock of turkeys that couldn't stay away from that fountain," he says. "I'd been photographing them for a few weeks. When I got this particular shot, I thought it was just so comical. It looks like the turkey and the angel statue are having a conversation."

216

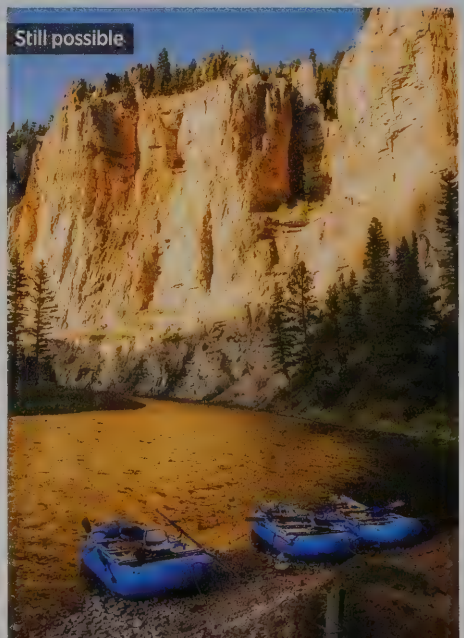
Number of watercraft carrying invasive animals or plants into Montana discovered during 100,000 inspections in 2018.

One last (slim) chance for the Smith

Even if you didn't draw one of the 1,288 coveted Smith River permits in FWP's 2019 lottery, floating the iconic 59-mile stretch this summer is not impossible.

When permit holders cancel, their permits become available on a first-come, first-served basis. Cancellations increase when water levels drop too low (below 250 cfs, often starting in late June or early July) for boats other than kayaks and canoes to float.

Call the Smith River Information Line at (406) 454-5861 for the latest cancellations. The call line is open Monday through Friday, 8 a.m. to noon. "If you're persistant and keep trying day after day, you can often pick up a canceled permit," says Colin Maas, manager of Smith River State Park. ■



WILDLIFE

Squirrel-shape disco lights soar overhead

Above: A flying squirrel glows bright pink under ultraviolet lights at night. Below: Comparison of a flying squirrel pelt under normal light with the same pelt under UV light.

If you're in the forest some night this summer, shine an ultraviolet light up into the trees. You might see bright day-glo shapes gliding overhead.

Researchers at Northland College in Wisconsin reported in the February 2019 issue of *Journal of Mammalogy* that flying squirrels turn pink under UV light. Many birds and butterflies also have UV fluorescence, but this is the first time scientists discovered it in mammals.

One theory is that the vivid pink color might have evolved to confuse great horned owls that prey on the squirrels. Because the raptors fluoresce in the same hue as flying squirrels, the squirrels might look like flying owls. Another possibility: If flying squirrels can see UV, something scientists have not yet proved, the color might be related to mating or other intra-squirrel communication.

"It could also just be not ecologically significant to the species," Allison Kohler, who studied the squirrels while at Northland, told the *New York Times*. "It could just be a cool color that they happen to produce."

Montana's northern flying squirrels live in forested areas west of a line that stretches from Yellowstone National Park to Glacier National Park. ■

CLOCKWISE FROM TOP LEFT: CARTOON BY MIKE MORAN; STAN TEKIELA/NATURESMART.COM; FIGURE 2.10, PAGE 67 GRAPHIC FROM *BEFORE YELLOWSTONE*; SHUTTERSTOCK; ALLISON KOHLER/NORTHLAND COLLEGE; ERIC HEIDLE

OUTDOOR ETIQUETTE

How to win respect at the boat ramp

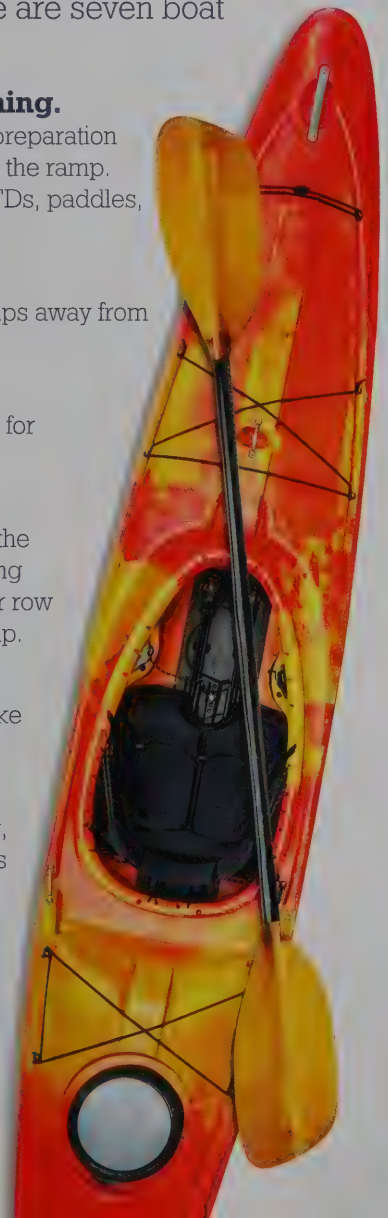
Some of the most valuable real estate in Montana isn't the property ringing Whitefish Lake or Big Sky Resort. It's those concrete boat ramps at FWP fishing access sites (FASs).

That's because the ramps are the only way boaters of all kinds can get into and out of Montana's popular rivers, lakes, and reservoirs.

Power boaters and drift boat operators have long used Montana's FAS boat ramps. Now, increasing numbers of kayakers, inner tubers, and stand-up paddleboarders are using ramps. Many are unaware of the rules and etiquette.

For everyone visiting an FAS, here are seven boat ramp basics:

- **Prepare your craft before launching.** When launching or retrieving, do as much preparation as possible off to the side, before you reach the ramp. Don't park on the ramp to load or unload PFDs, paddles, coolers, and other gear.
- **Blow it up elsewhere.** Inflate and rig rafts, inner tubes, and blow-ups away from the ramp.
- **Park in the right place.** Don't park your vehicle in areas designated for vehicles with boat trailers.
- **Get a move on.** Once you're on the water, move away from the ramp. Don't linger in front of the ramp rigging rods or adjusting oars or paddles. Paddle or row downstream a bit so others can use the ramp.
- **Socialize on the sidelines.** Don't block the ramp to visit with friends, take pictures, or wash off gear. Move to the side.
- **Swim elsewhere.** Don't swim, wade, throw sticks for your dog, or do other things at a boat ramp that blocks boaters trying to get into or out of the water.
- **Thank an angler.** Anglers, through their annual fishing license purchases, pay for most of the acquisition and maintenance of Montana's 338 fishing access sites. ■



An illustration from *Before Yellowstone* compares the size of the larger ancient bison with a contemporary American bison and a human.

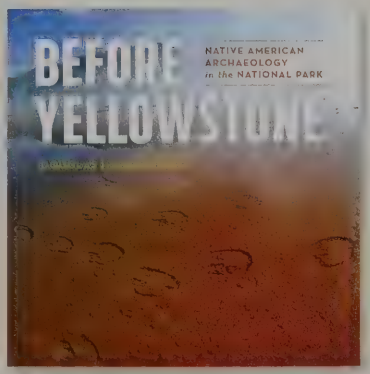
Pre-park Yellowstone

Occasionally a book crosses our desk that we need to recommend. In this case it's ***Before Yellowstone: Native American Archaeology in the National Park***, by University of Montana professor of anthropology Douglas H. MacDonald.

For fans of Yellowstone National Park—and who isn't?—this fascinating book tells the story of human habitation in the region before European exploration and eventual designation as the world's first national park.

Starting at the end of the last ice age, the region was home to Paleo-Indians and then Shoshone, Bannock, Salish, and Nez Perce tribes, among others. MacDonald and his team of students scoured the park to document evidence of these first inhabitants: tipi rings, campsites, atlatl dart tips and arrowheads, petroglyphs, fasting beds, and hunting blinds.

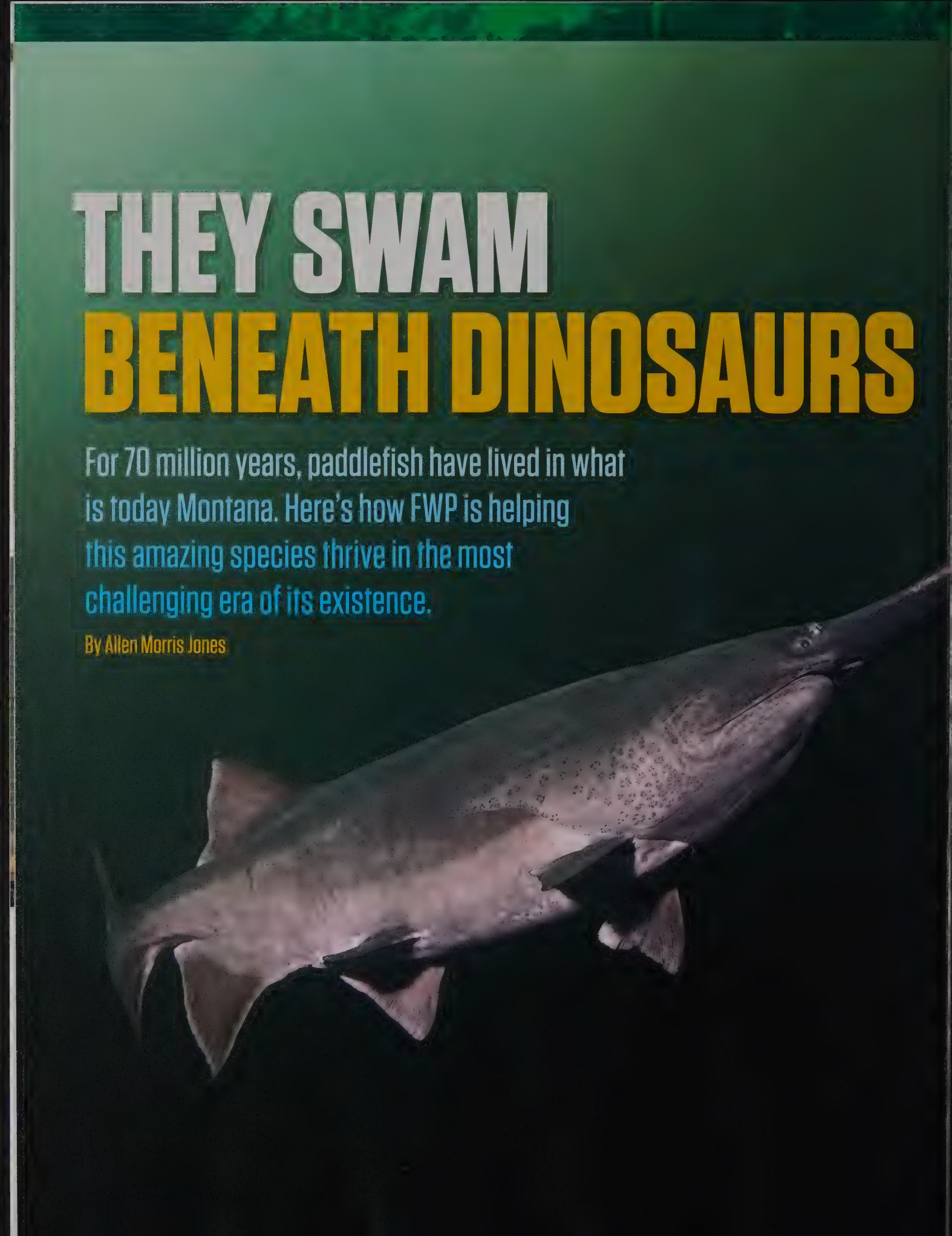
The book includes details of the Clovis spear head discoveries, including those near Yellowstone Lake that proved humans reached the area 11,000 years ago. ■



THEY SWAM BENEATH DINOSAURS

For 70 million years, paddlefish have lived in what is today Montana. Here's how FWP is helping this amazing species thrive in the most challenging era of its existence.

By Allen Morris Jones



The first time I went paddlefishing, I must have been in my late teens, just finishing high school. It was me, my dad, my older brother, and probably a family friend who showed us the ropes. Paddlefishing isn't a sport you just jump into. You need a guide, somebody who knows the game. Because it's not exactly "fishing." In fact, it's about as far from the classic Montana fly-fishing—minuscule flies, featherweight rods, delicate casts—as you can imagine.

When you go paddlefishing, your job is to catch a paddlefish. There's something downright utilitarian about it. It's a sport of muddy banks and high brown water. Surf-casting rods and reels, stout fishing line, five ounces of lead sinker, and a sharp, heavy-gauge treble hook the size of a hawk's talon. Lawn chairs. A friend to spell you, because it's not a bad idea to work in shifts. You heave that thing out. Jerk it back. Quickly reel in the slack. Jerk. Reel in the slack. Get hung up on a submerged log. Cuss. Repeat. Hour after hour after hour.

Finally, you get hung up for the umpteenth time, but now the snag starts to move, taking out line. The first few seconds, you think maybe it's your imagination. But then, no.

By the time you finally bring your first paddlefish into the shallows at your feet, you're sunburnt, sweaty, smeared with mud. And then, to see the fish, to see this amazing creature roll up out of the chocolate milky river—beady-eyed, toothless, with a cavernous mouth and a spoonbilled snout like a canoe paddle—is to experience a near existential disconnect. Here's this familiar river, the Yellowstone or the Missouri. Here's this creature, alien to look at yet living in this part of the continent for more than 70 million years. And here's the two of you, eye to eye.

Across those millions of years, the paddlefish has faced countless threats: asteroids, volcanoes, an ice sheet pushing the Missouri River south to flow into the Mississippi rather than Hudson Bay. One ecosystem opening up, another closing down.

But of all the threats throughout the species' long existence, the current calamity of humanity is its greatest. There are two paddlefish species worldwide: the American paddlefish in the Mississippi River drainage and the Chinese paddlefish in the Yangtze River. The Chinese spoonbill hasn't been seen for

BIG GAME FISHING Heavy-duty saltwater rods and reels are required to snag then haul in paddlefish, which can weigh over 100 pounds.

LEFT TO RIGHT: ERIC ENGBRETSON, JEREMIE HOLLMAN

more than 15 years. It's likely extinct. That leaves the American paddlefish, a Darwinian cage brawler capable, so far, of surviving even the damming of its habitat and the accompanying disruption of upstream spawning.

Here in the United States, thankfully, the species is exceptionally well managed. And it's managed with a devotion, passion, and cooperation—by vested parties that include the states, the federal government, tribes, anglers, and local communities—that's close to astonishing. Not only is the species surviving, in places it seems to be thriving, including parts of Montana. For a generation and more, disparate interests have come together in the interests of paddlefish. At the intersection of sport and management, this prehistoric species is a poster child for how conservation can actually succeed.

FREEZER BOUND An angler heads home after harvesting a paddlefish on the Missouri River upstream from Fort Peck Reservoir.

TWO POPULATIONS

Like baleen whales, paddlefish are filter feeders that live on microscopic zooplankton. With their massive mouths wide open, they cruise through reservoirs and river backwaters sucking in water through gill rakers that comb it for protein. They won't take a lure because they don't eat anything that vaguely resembles what a lure might represent. To catch one, you need to snag it.

The gill rakers look like pale, fibrous, flexible combs. The fish's massive schnoz, called a rostrum, is visibly speckled with sensors that detect the electrical signals of swarming zooplankton. The meat, if you're lucky enough to haul in a paddlefish and can keep it, is delicious: white and firm, a bit like oily halibut. Paddlefish also produce tiny, delectable eggs—caviar that, given the worldwide decline of sturgeon, is in increasing demand. A single female can carry half a million eggs.

Paddlefish swim in large rivers and reservoirs in 22 states throughout the Mississippi River Basin. Two populations live in Montana and northwestern North Dakota. The Fort Peck Reservoir population lives in the large impoundment and spawns on gravel bars upstream as far as Morony Dam near Great Falls, the historic westernmost reach of the species' North American range. The Yellowstone-Sakakawea population swims in Sakakawea Reservoir in western North Dakota and makes a spawning run each spring up the Missouri (to Fort Peck Dam), Milk, Powder, and lower Yellowstone Rivers.

Montana's paddlefishing regulations are complicated, taking up three full pages in the fishing regulations booklet. "It's complex because we're trying to provide as much recreational opportunity as possible while still conserving the population," says Steve Dalbey, FWP regional fisheries manager in Glasgow. To fish the waters above Fort Peck, anglers must apply by March 29 for an annual lottery that issues 1,000 permits, known as White Tags. "These harvest tags translate into an actual harvest of 300 to 500 paddlefish, which is a sustainable number for this population," Dalbey says.

On the Yellowstone and Missouri downstream from Fort Peck, unlimited licenses known as Yellow Tags are available over the counter. Most of the harvest in this fishery is at Intake, where a 5-foot-tall, 700-foot-wide structure diverts water into a system of irrigation canals. The diversion dam also blocks upstream paddlefish movement in all but the highest flows. When the estimated harvest for this population approaches the cap of 1,000 fish, FWP closes the harvest season but allows several additional days of catch-and-release fishing.

EASY CAMARADERIE

It's the third week of May 2018, and Mike Backes has set up a station on a picnic table 50 yards from the Yellowstone River at Intake. The river is flowing hard, at around 50,000 cubic feet per second, and below the dam more than two dozen paddlefishers stand knee-deep in the water. I see a lot of wet denim and coolers, and there's an easy

WHAT IS THAT? Children examine a paddlefish caught at Intake. With its scaleless skin, massive mouth, and paddle-shaped nose, the prehistoric species looks unlike most fish.

PADDLEFISHING AT INTAKE Clockwise from top left: Yellow possession tags are issued for the paddlefish stock downstream from Fort Peck Reservoir and the Yellowstone River; paddlefishers cast from the banks of the Yellowstone at Intake; an FWP technician scans for an embedded tracking chip before placing a harvested paddlefish on a conveyor belt at the Intake cleaning station; a portion of the lower jaw is reserved for research; paddlefish fillets harvested from a catch; a lunker paddlefish hangs on a scale; FWP regional fisheries manager Mike Backes records harvest data.

camaraderie among the paddlefishers. Every now and then, as a paddlefish is snagged, other anglers reel in and step back, watching as the fish takes its captor for a walk down the bank.

Backes, the FWP regional fisheries manager in Miles City, keeps an ongoing harvest tally on a whiteboard. So far, 29 fish have been caught today, making it 166 for the season. The largest to date weighed 99 pounds. Males run about 20 to 30 pounds, Backes says, and females go from 40 pounds to over 100. The state record, caught in 1973, was 142.5 pounds.

As each paddlefish is caught, the harvester carries it to the station where Backes and an assistant, Tanner Carlson, weigh it, take measurements, and run a metal detector around the rostrum looking for an implanted tracking chip. They also remove a section of the lower jaw. Then they pass the fish along to a cleaning station maintained by the Glendive Chamber of Commerce.

The paddlefish caught at Intake spend most of their lives in North Dakota's Lake Sakakawea. Backes says they start heading upstream to spawn in April or early May. "They get to the confluence of the Yellowstone and the Missouri and wait for one of the rivers to pulse with bigger flows," he says. "That triggers upstream movement. They are attracted to increasing flows and turbidity, conditions that likely reduce predation on eggs and larval fish."

In 2007, FWP instituted alternating harvest and catch-and-release days for the Yellow Tag licenses. This provides additional recreation for anglers who want to tussle with a paddlefish but not take it home. It also extends the season by breaking up the harvest momentum. That gives managers a little breathing room to figure out the appropriate time to close the season. Close it too soon, and they deny paddlefishers harvest opportunities. Close it too late, and the adult population could be overharvested. Catch-and-release at Intake also helps FWP biologists gather important biological information (see "Paddlefish releasers provide essential data," page 14).

Since 1990, the Glendive Chamber of

Allen Morris Jones is a novelist, editor, and publisher in Bozeman.

ALL PHOTOS THIS PAGE ALLEN MORRIS JONES, EXCEPT TOP LEFT: JEREMIE HOLLMAN

Commerce has hired processors to clean the paddlefish caught at Intake (and brought there from nearby areas) in exchange for the fish eggs. The roe is later sprinkled with sea salt, canned, and sold as caviar. Roughly 30 percent of the caviar sale proceeds help pay for FWP paddlefish research and management. The chamber puts the rest into a grant program that funds projects like playground equipment, museum exhibits, and other cultural and recreational amenities across eastern Montana.

Also helping out at Intake today is Dennis Scarnecchia, a fisheries professor at the University of Idaho in Moscow. As Scarnecchia helps haul fish from the FWP scale to the chamber's cleaning station, he keeps an eye on Carlson's work, offering helpful suggestions to the FWP fisheries technician. It's expert advice. Scarnecchia has studied this fishery for nearly three decades. Much of what is known about the two paddlefish populations comes from his widely respected research. The jaw samples will eventually end up under microscopes in Scarnecchia's lab, where he and his staff count growth rings, like those on trees, to age the fish.

BACK YOU GO An angler releases a healthy paddlefish into the Missouri River to swim another day.

HARDER TO LOCATE

Montana's other major paddlefish fishery is on the Missouri River west of Fort Peck Reservoir, around the Fred Robinson Bridge in the Upper Missouri Breaks National Monument and Charles M. Russell National Wildlife Refuge. Each year roughly 5,000 to 10,000 paddlefish swim upstream from the reservoir to spawn, roughly half the number that spawn in the Yellowstone.

There's no diversion dam here to block upstream movement, so paddlefish are more spread out than at Intake and harder to locate. Some paddlefishers use boats to travel along the river, setting up bankside campsites at places where the fish might lurk. There's also no caviar program on the Missouri, so anglers need to dress and fillet their own catch. If they don't draw one of the 1,000 permits to harvest a paddlefish in this stretch, they can still practice catch-and-release throughout the season, which here runs May 1 through June 15.

Cody Nagel, FWP fisheries biologist at Havre, says he and colleagues learned where these paddlefish swim throughout the year from an early 2000s telemetry study that followed the movement of roughly 120 fish over seven years. "We saw how they respond to low and high flows, which helps us understand the conditions for ideal spawning," he says. To gather more information, each spring FWP crews in boats drift long nets downriver to entangle

CLOCKWISE FROM BOTTOM LEFT: CALEB BOLLMAN; BRANDON KIESLING; ZACHARY SHATTUCK; ERIC ERICKSON

Paddlefish releasers at Intake Dam provide FWP with essential data

Some call it "snag-and-release." The basic idea is to haul in a paddlefish and then let it go to swim another day, just as anglers do with many other game fish species. "Some people aren't into the meat and the harvest," says Caleb Bollman, FWP fisheries biologist in Miles City. "They just like feeling the power of a paddlefish on the line and seeing the fish up close."

After taking measurements, FWP biologist Zach Shattuck releases an angler-snagged paddlefish back into the Yellowstone River.

In addition to providing additional recreation, catch-and-release paddlefishing at Intake also supplies FWP with vast amounts of scientific information. When an angler hauls in a fish on a designated catch-and-release day, an FWP creel clerk wades in and helps land and unhook it. The clerk measures the fish, determines its sex, then checks for a jaw tag and records the number. If there's no tag, the clerk inserts one. After a quick photograph or two with the paddlefisher, the fish is carefully released back into the water.

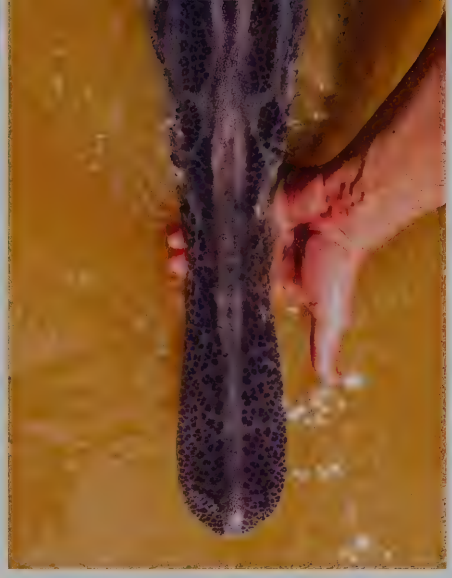
Such information gathering can't be done upstream from Fort Peck because paddlefishers there are widely spread out along many miles of river. At Intake, the activity is focused at a single location.

Bollman says that anglers in North Dakota and Montana, combined, harvest 2,000 adult paddlefish each spring from the Yellowstone-Sakakawea fishery. Most of the fish are weighed and aged, and all numbered jaw tags are reported to provide other information. "Then with the additional catch-and-release fish, we handle another up to 4,000 fish annually. That at least doubles or even triples the sample size," he says.

paddlefish moving upstream. The fish are quickly brought onboard, weighed, jaw tagged, and released. Paddlefishers are required to report the tag number when they harvest a fish, and catch-and-release anglers are encouraged to do the same.

Nagel and his colleagues also cruise established routes, called transects, in late summer in the upper reaches of Fort Peck Reservoir. Young paddlefish that hatched earlier in the summer stay near the surface. When the boat approaches the fingerlings, they surface briefly and can be counted. The information helps scientists determine the strength of each "year class" and better understand how spring factors, such as river flow and temperature, contribute to stronger or weaker generations of paddlefish.

"We know that the best spawning success comes from years with high flows for a long duration, peaking in the first couple of weeks in June," Nagel says. "We've also learned that young-of-the-year paddlefish, as they move back down into Fort Peck in midsummer, need rising water levels in the reservoir that produce more zooplankton." Inadequate food supplies prevent them from growing fast enough and limit their ability to build fat reserves needed to survive the cold months. "If they can get through that first winter, most end up living for a long time," Nagel says.



FOOD FINDER The species' namesake rostrum is covered in sensors that help it locate microscopic zooplankton.

Data compiled on the two paddlefish populations is used to develop a management plan every 10 years. Produced jointly by Montana, North Dakota, and Scarnecchia, the 2018 plan provides direction and a course of action for paddlefish managers over the next decade. Key to the plan, Backes says, is "making sure we're managing the populations sustainably." That means ensuring appropriate harvest, identifying critical habitats—and threats to those habitats—and continually monitoring the fish populations. "Without high-quality data, we can't assess fish stocks and manage for the long term," he says.

An affinity for one type of fishing over another is a matter of taste. We like what we like and then create rationalizations to support that choice. For every dry-fly purist going on at length about the superiority of his approach, there's a pragmatic nympher who laments how her sport has been taken over by snobs. And for every walleye troller shopping for the latest GPS fish finder, there's a paddlefisher content to just have a chance to wade a big river in late spring, fling out a heavily weighted treble hook, and start yanking.

"Paddlefishing is getting that first sunburn of the season and taking your first camping trip with family and friends," says Dalbey, the Glasgow-based fisheries manager. "But what sets it apart from all other types of angling is that you're fishing for a species that was swimming here when dinosaurs were walking around. That's an incredible opportunity. We're doing everything we can to make sure it continues far into the future."

To read the latest management report, search online for "Management Plan for North Dakota and Montana Paddlefish Stocks and Fisheries."

Straining water for zooplankton

In addition, Bollman says, having the clerk nearby ensures that paddlefish are handled correctly for the best odds of survival. "Many of these fish are caught and released several times over their lifetime," he says. "That gives us great information we can't get from harvested fish. Over a period of several decades, we'll end up with capture histories that will allow for some pretty powerful statistical analysis and population modeling." ■

—Ed.

10 Tips to Ensure Safe Paddlefish Release

By using proper landing and release techniques, paddlefishers can help ensure that more of these remarkable fish remain in rivers where they have lived for eons.

1. Use heavy line to prevent break-offs.
2. Consider using a treble hook smaller than the 8/0 legal maximum size, and flatten barbs to make removal easier.
3. Land fish quickly; do not play to exhaustion.
4. Look downstream and plan where to land fish, avoiding steep banks, strong current, boulders, trees or willows, or snags that make landing a fish difficult.
5. Don't use a gaff to land a fish intended for release.
6. Always keep paddlefish in the water, as required by law (see the FWP fishing regulations for details).
7. Minimize handling time of fish, including time spent taking pictures.
8. Keep the fish in a horizontal position.
9. Do not lift the fish by the gill arch (flap). Control the fish by holding the rostrum (snout) or tail.
10. When releasing the fish, hold it by the rostrum, facing into the current, until it can swim away on its own.

Note: Be sure to read the FWP fishing regulations to ensure that catch-and-release paddlefishing is allowed at your fishing destination. Some areas are closed to catch-and-release.

PRETTY LITTLE PREDATORS

Dragonflies are lovely to look at. Unless you're a mosquito or other prey. BY DAVE SHEPARD

BEAUTIFUL BEAST Taking a break from hunting, a saffron-winged meadowhawk dragonfly rests on a leaf. Sunlight shining through its wings refracts into a prism of colors.

PHOTO BY JOHN ASHLEY

The most efficient predator in the animal kingdom doesn't have huge claws, fearsome fangs, or sharp talons. Its body isn't covered by fur or feathers, and it most certainly does not appear to be well camouflaged.

This fearsome predator weighs less than an ounce, has six legs and four wings, and can often be a brilliant iridescent color. It's the dragonfly.

Dragonflies have the highest success rate of any predator. Wolves are successful less than 20 percent of the time when they try to catch prey. In South Africa's Kruger National Park, six of seven leopard hunts end in failure. Studies of Bengal tigers in India's Kanha National Park estimate that just one in 20 hunts results in a kill. Yet Harvard University researchers have found that dragonflies capture prey such as mosquitoes in 90 to 97 percent of attempts. "The brain uses a highly optimized hunting strategy that allows the dragonfly to predict where the prey is going and the appropriate muscle commands to intercept it," neuroscientist Anthony Leonardo of the Howard Hughes Medical Institute in Maryland told the BBC in 2015.

Dave Shepard is a writer and photographer in Bozeman.

Dragonflies are one of the most ancient flying insects. They first appeared almost 300 million years ago, predating dinosaurs. That has given them a long time to perfect their flying and hunting skills.

More than 5,000 species of dragonflies and the closely related damselflies occur worldwide. The smallest wingspans are just three-quarters of an inch, while the largest span more than six inches. Scientists have identified 34 damselfly species and 59 dragonfly species in Montana, the largest with a wingspan of about four inches.

Dragonflies and damselflies belong to the order Odonata, from the Greek *odontos*, meaning "toothed one." Though they don't have teeth like most carnivores, dragonflies possess powerful serrated mandibles, or jawbones, used to hold and crush prey. Even better than teeth, you might say, considering the dragonfly's predatory proficiency.

UNDERWATER TERRORS

A dragonfly begins life as an egg, laid inside plant tissue or directly in water. Eggs hatch into aquatic nymphs, the form in which a dragonfly spends most of its life. The larval stage lasts only a few months for smaller species, but it extends to over five years for larger ones. The nymphs are as accomplished at hunting underwater as their adult forms are in the air. When chasing prey, nymphs expel water though gills in the rectum, creating a type of jet propulsion. A hinged, toothed mouth part called a labium shoots forward and rapidly retracts, capturing and pulling prey to their mouth. These voracious feeders eat almost anything they can capture, including mosquito and other insect larvae, bloodworms, tadpoles, and even small fish.

Dragonflies undergo what's known as an incomplete metamorphosis. They do not have a pupal stage; the adult emerges directly from the nymph. When ready to become an adult, the nymph makes its way to the water surface, generally at night, and begins to breathe air. It crawls out of the water onto a reed or other plant, molts its

Flame skimmer dragonfly

STACY THORNBRUGH

Dragonfly nymph

outer skin, and emerges as an adult dragonfly. Depending on the species, it will live from only a few weeks to almost two years.

AERIAL ACES

Dragonflies may be the most accomplished fliers in the insect world. This is in large part due to the unique muscles that operate their wings. Most insects' wings are indirectly operated by muscles attached to the thorax. When the muscles contract, the entire thorax flexes, causing the wings to move. This is like trying to flex your shoulder blades by taking a deep breath. It's an efficient use of energy, but limits maneuverability.

The dragonfly's wing muscles are attached directly to a hinged base on each wing. While the fore and hind wings of most four-winged insects are coupled and move together, each of the dragonfly's four wings has its own set of muscles and can be operated independently. This allows dragonflies to change direction and speed far faster than most insects.

In addition to the independent wing movement, a dragonfly's wing structure is remarkably stabile and strong.

These attributes allow some large dragonflies to fly at speeds of more than 30 miles per hour. Dragonflies can also fly in six directions—left, right, up, down, forward, and backward—and hover in place for as long as a minute. You'd think all this flying ability would require an insanely rapid wingbeat. Yet a dragonfly beats its wings a relatively modest 30 times per second. Compare that with bees, which beat their wings more than 200 times per second, or a mosquito, whose wings beat up to 800 times per second.

One disadvantage of the dragonfly's zippy, multidirectional flight is that it requires vast amounts of energy. To fuel this demand, a dragonfly must eat 20 percent or more of its body weight daily. For a paddle-tailed darner, that means consuming about 80 mosquitoes.

Dragonflies use their six specialized legs to form a basket and catch their prey while

NYMPH PHOTO: SHUTTERSTOCK; PHOTO ILLUSTRATION BY LUKE DURAN/*MONTANA OUTDOORS*

The continual search for Montana odonates

People began to study Montana's odonates (dragonflies and damselflies) in the 1870s, when H. Hagen conducted natural history surveys of what would soon be Yellowstone National Park. Over the next century, several other authors contributed to that base of knowledge. In 1975, George Roemhild produced a comprehensive paper covering the damselfly species in Montana. In the mid-1990s, Kelly Miller and Daniel Gustafson presented a concise list of all known odonate species in Montana, along with notes on the history, known distribution, and potential species that likely lived here but hadn't yet been seen. At that time, 80 odonate species were known to occur in Montana. Recent aquatic insect surveys conducted by Dave Stagliano while working for the Montana Natural Heritage Program boosted the understanding of odonates here.

I began adding to the knowledge base of this fascinating group of insects starting in 2008. Fueled by personal interest, I began researching the known distribution, habitat requirements, and occurrence potential of Montana's odonates. Using new technologies such as Google Earth satellite imaging, I identified potential habitats of dragonfly and damselfly species not yet known to occur in those areas. The sites often contained populations of species I'd hoped to find.

Over the past decade, fellow odonate enthusiast Bob Martinka (a retired FWP senior manager) and I sampled sites and habitat types in every Montana county. We have added 13 new species to Montana's odonate list and expanded the known range of many other species, some of which had previously been documented from only a single location. To date, 59 species of dragonflies and 34 species of damselflies have been documented within Montana. All of this recently gathered data has been presented to the Montana Natural Heritage Program and deposited within Odonata Central, a national database that houses the most comprehensive range maps of North American odonates. ■

—Nate Kohler, Deer Lodge, is a naturalist specializing in birds and odonates.

BEAUTY IN MOTION Top row, from left to right: boreal bluet damselfly, cherry-faced meadowhawk dragonfly, river jewelwing damselfly. Above row: widow skimmer dragonfly, paddle-tailed darner dragonfly, pale snaketail dragonfly. Below row: band-winged meadowhawk dragonfly, spiny baskettail dragonfly, eastern forktail damselfly. Bottom row: chalk-fronted corporal dragonfly, eight-spotted skimmer dragonfly, blue dasher dragonfly.

flying. They subdue prey with a bite from the powerful mandibles, stripping off the wings before devouring the unlucky insect. Many dragonfly species perform this midair.

Despite having powerful legs, dragonflies cannot walk; they are only able to perch.

THE EYES HAVE IT

A dragonfly has huge eyes containing up to 30,000 lenses. Its curved eyes give the insect a nearly 360-degree field of vision, with only a small blind spot directly behind its head. Dragonflies may perceive more colors than humans can even imagine. We have three light-sensitive proteins, called opsins, in our retinas. Each opsin absorbs one color—in our case red, blue, or green. Dragonflies have as many as 30 opsins. These are not evenly distributed like ours but instead are arranged in ways that optimize their vision for hunting.

The dragonfly has one more trick in its hunting arsenal: camouflage. Though the brightly colored, constantly moving insects seem conspicuous to humans, they are far less so to their prey. Even more effective is the specific stalking technique that dragonflies employ known as motion camouflage. The hunter chooses a path that makes it appear stationary to its target. It does this by moving in a perfectly straight line toward the prey. Human hunters sometimes use this method to close the gap between themselves and big game animals like elk.

HINDSIGHT A closeup of a common green darner shows how this dragonfly's huge, curved eyes provide it with a nearly 360-degree field of vision.

DRAGONFLY WATCHING

Despite their physical beauty and aerial acrobatics, dragonflies haven't attracted much attention from wildlife watchers. One exception is the annual Dragonfly Festival at Bitter Lake National Wildlife Refuge in New Mexico; the festival will celebrate its 18th year in September 2019. Watchers at the small desert refuge have seen more than 100 species of dragonflies and damselflies.

Great dragonfly watching is likely closer than you think. Look for the insects in any relatively open area near water. If you see mosquitos or other flying bugs, hungry dragonflies will be nearby.

Field guides help with identification. My favorite is *Dragonflies and Damselflies of the West* by Dennis Paulson. Online, try odesforbeginners.com. Smartphone apps like "Dragonfly and Damselfly Field Guide" also are handy. Note that there are many diverse dragonfly species, including cruisers, darners, skimmers, emeralds, and hawkers.

Dragonflies and damselflies are important beyond their captivating appearance and behavior. For instance, they indicate the health or weakness of ecosystems. Currently six dragonfly and one damselfly species are listed as "species of concern" by the Montana Natural Heritage Program. This is primarily a result of habitat loss, entomologists say.

Then there's the fact that mosquito-borne viruses like West Nile and Zika are spreading through parts of the United States. A healthy dragonfly population helps control mosquito numbers and potentially reduce disease transmission. Dragonflies are a mosquito's worst nightmare.

To paraphrase the marine biologist played by Richard Dreyfuss in the movie *Jaws*: Dragonflies are the perfect predators. All they do is fly, eat, and make little dragonflies. Fortunately for us, they are also beautiful, fascinating, and easily observed creatures that direct much of their bloodlust toward insects that we'd rather not have around.

DRAGON OR DAMSEL?

Paddle-tailed darner dragonfly

Dragonflies and damselflies are closely related and similar looking. How to tell them apart:

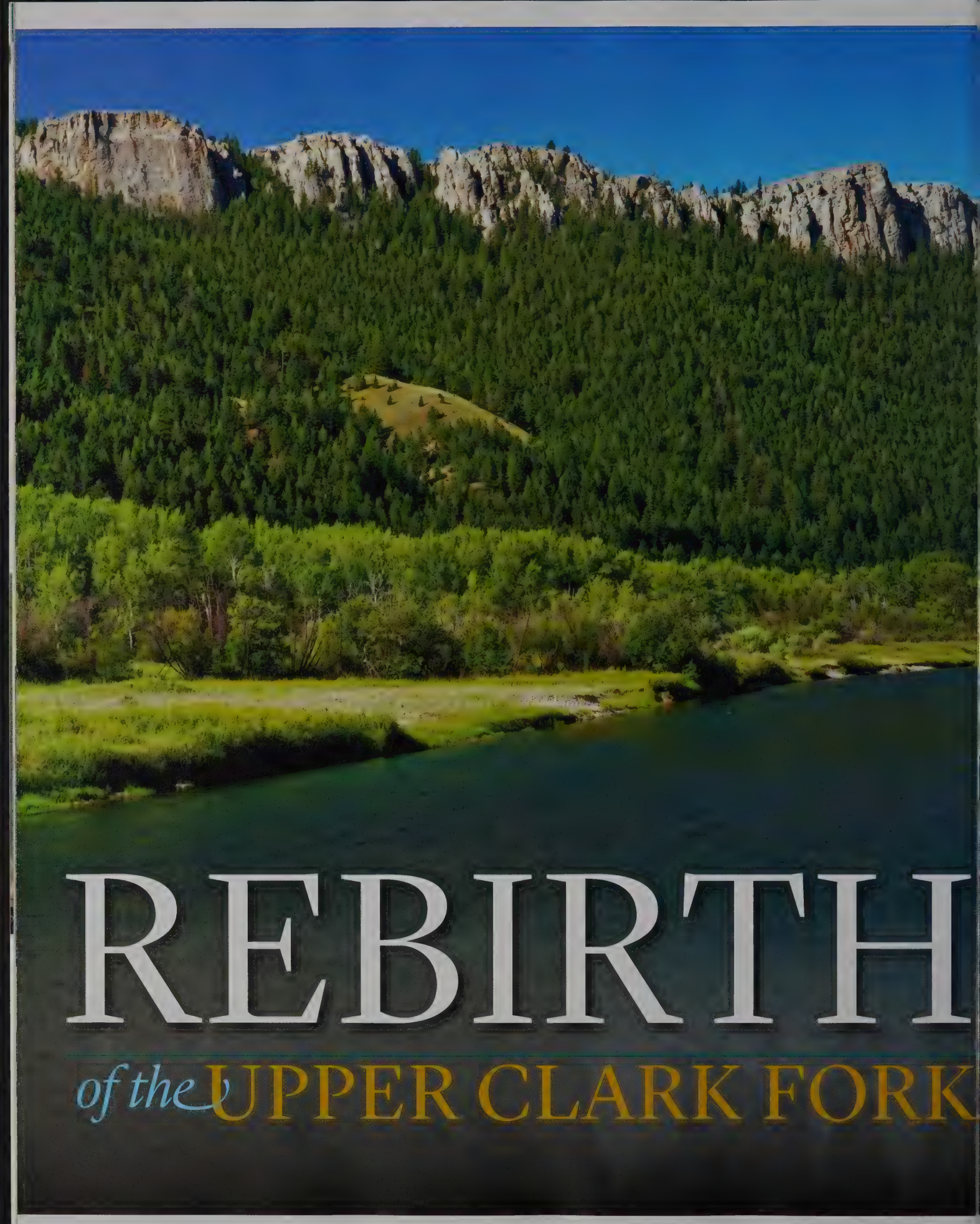
- Dragonflies have much larger eyes, with no gap in between. A damselfly's eyes are smaller and separated.
- Dragonflies have slightly heftier bodies. Damselfly bodies look like slender twigs.
- The back wings of dragonflies are broader at the base, while those of a damselfly are narrow at the base.
- At rest, dragonflies hold their wings perpendicular to their body, like an airplane. Damselflies fold their wings and hold them together on their back.

Above: dragonfly

Below: damselfly

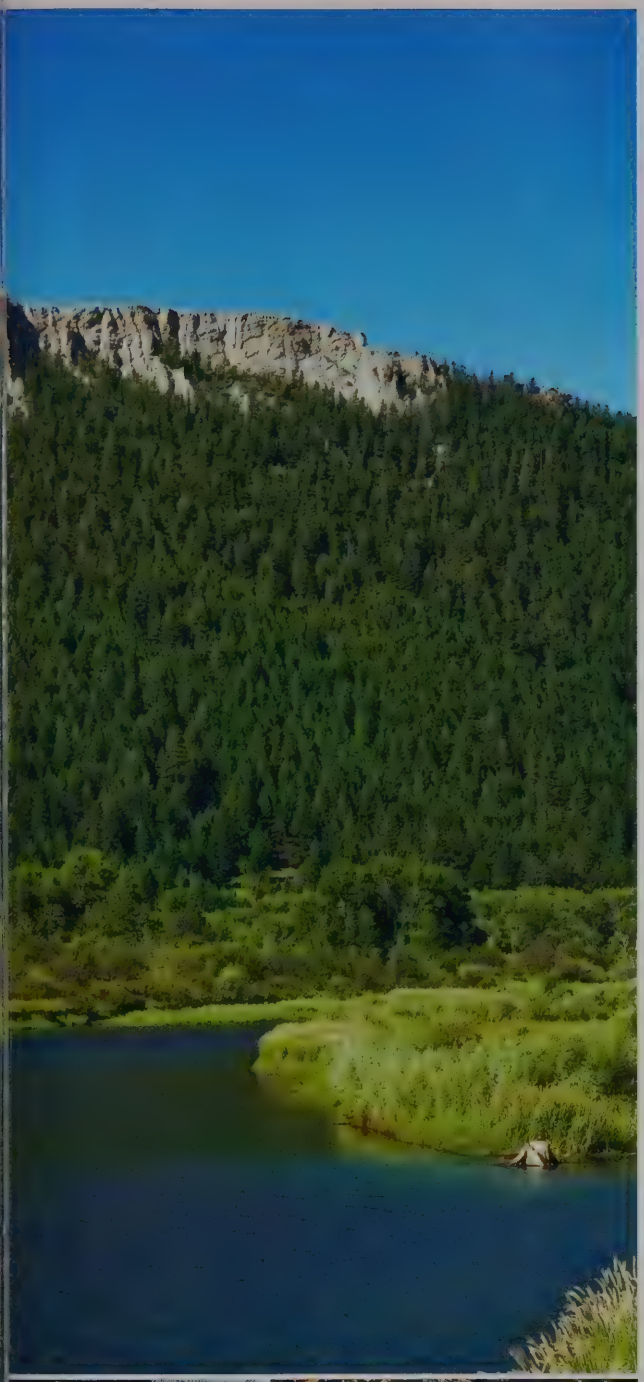
OPPOSITE PAGE CLOCKWISE FROM TOP LEFT: ELIZABETH MOORE; BOB MARTINKA; NATE KOHLER; DAVE RUMMANS; SEAN R. HEAVEY; ELIZABETH MOORE; STEVEN AXFORD; MICHAEL H. FRANCIS; MORNING SUN YELLOW PONY; DIANE BROWDER; DAVE SHEPARD; MICHAEL H. FRANCIS. ABOVE RIGHT: BOB MARTINKA

CLOCKWISE FROM FAR LEFT: DAVE SHEPARD; SHUTTERSTOCK; SHUTTERSTOCK



REBIRTH

of the UPPER CLARK FORK



JOHN LAMBING. INSET PHOTO: JOSH BERGAN

NO ONE CAN MAKE A NEW RIVER... EXCEPT MAYBE THEY CAN.

BY TOM REED

When the fishing is slow, my mind tends to wander. On a sunny spring day on the Clark Fork River, when the trout don't seem interested in my offerings, I'm daydreaming about many things, including the river itself.

One thing I ponder is that just being able to fish this river at all is sort of a miracle. That's because the Clark Fork of the Columbia, as it's officially called, has been abused beyond measure. Over the past century it has been polluted, dredged, dried up, and dammed. Yet despite decades of mistreatment, the river and surrounding lands are showing signs of renewal. That progress and potential are due to hard work—by conservation-minded Montanans, federal and state agencies, and industry—to repair past damage and learn to consider the Clark Fork in a new light.

PAID A PRICE

Named by the Corps of Discovery for its co-leader in 1806, the Clark Fork begins a few miles northwest of Butte where Silver Bow Creek and Warm Springs Creek meet. From there to the Idaho Panhandle 310 miles downstream, it's one of Montana's most visible rivers, running alongside I-90 and U.S. Highway 200.

The Clark Fork is also one of Montana's most industrial waterways. First it was a pathway for Native Americans, then a watery highway for explorers like Lewis and Clark and Canadian David Thompson, then a conveyor belt to move millions of logs downstream. Where the upper Clark Fork (upstream from Missoula) meets the Blackfoot River at Bonner, copper tycoon William A. Clark (no relation) built a hydropower facility. The famous Milltown Dam generated electricity to run two nearby sawmills that produced railroad ties and beams for upstream copper mines.

During the height of World War II, Butte's mines supplied ore for Anaconda's smelters across the valley. Montana copper went into

A RIVER GETS RUINED Clockwise from above: Anaconda Hill in Butte, 1900, when copper mining was revving up; a log jam after the flood of 1908, with the Bonner mill visible in the background; the Silver Bow "sewer," where mine tailings were dumped into Silver Bow Creek; the Clark Fork River pours over Milltown Dam during the 1908 flood; a sign warning of mine pollution in the upper Clark Fork, designated as the nation's largest Superfund site in 1992; "slickens," blue copper salts of mine tailings, deposited on the floodplain of the Clark Fork River near Galen.

everything from Jeeps to B-24 Liberator bombers, and the thriving cities of Butte and Anaconda rightfully claimed significant roles in the Allied victory. "It was probably worth it, given the national security stakes at the time, but the river and its tributaries paid the price for all that mining," says Pat Saffel, FWP regional fisheries manager in Missoula.

Degradation began in the upper reaches of the river system, where miners used pickaxes, then steam shovels, then bulldozers to dig up silver, gold, and copper valued by a growing nation. Open mineshafts and piles of mining waste exposed pyrite-rich ore to oxygen and water. The chemical reaction produced sulfuric acid, which washed into tributary streams like Silver Bow Creek, Flint Creek, and the Little Blackfoot River. Along the way it killed aquatic insects and young fish. Downstream cities, towns, and ranches added effluent from livestock and humans to the mix.

The greatest single assault on the Clark Fork came on June 2, 1908. Snow had choked Butte all spring. In late May came days of rain. On June 2, almost an inch fell, washing mining sediment off the sediment piles surrounding the city. Streams running orange with acid mine drainage fed into dirt streets and alleys that quickly turned into raging torrents of sludge. The Clark Fork River exploded from its banks. The flood carried millions of tons of silt laden with arsenic, lead, zinc, and copper downstream to Milltown Dam, built just six months earlier. The dam held, and the toxic sediment settled. There it sat for more than a century.

TOXIC TIME BOMB

The underwater sludge behind Milltown

The dam held, and the toxic sediment settled. There it sat for more than a century.

BAD DIRT Removing toxic sediment from below Milltown Reservoir after drainage.

CLOCKWISE FROM TOP LEFT: BUTTE-SILVER BOW PUBLIC LIBRARY; MANSFIELD LIBRARY, ARCHIVES & SPECIAL COLLECTIONS, UM-MISSOULA; CLARK FORK COALITION; MONTANA MEMORY PROJECT; TOM BAUER; JOHN LAMBING; MARK EISENBEL

Tom Reed has written books about horses, trout fishing, and grizzlies. He lives in Harrison.

Dam posed a potential health hazard to aquatic life downstream. A 1986 flood dragged ice floes from the upper river, dredged Milltown Reservoir, and sent loosened sediment and toxins over the dam. A similar event in 1996 sent concentrations of toxic copper skyrocketing to 2,000 percent over state standards, wiping out more than half the trout in the Missoula reach.

In addition to killing fish outright, acid that leached from mountains of mine tailings near Anaconda and Butte dissolved lead, cadmium, and copper. The heavy metals disrupted gill function and caused trout and aquatic insects to suffocate. For decades, fish kills following heavy rains were common. The Clark Fork's trout population plummeted to just a fraction of what the river previously supported.

The dam itself blocked migrating fish trying to swim up and down the Clark Fork and Blackfoot. FWP fisheries biologist David Schmetterling documented the problem in the late 1990s. He and colleagues showed that each year the dam blocked the upstream movement of roughly 200,000 fish, including westslope cutthroat trout and, most significant, federally threatened bull trout.

The bull trout plight put added pressure on the federal government and the dam's owner at the time, Atlantic Richfield Company (ARCO), to dismantle Milltown Dam. By this time, scientists had already confirmed that arsenic leaching from the sediment below the reservoir into underground aquifers had contaminated water supplies of nearby residents. In 1992, the Clark Fork from Milltown upstream to Butte was designated as the country's largest Environmental Protection Agency Superfund site.

Yet even after the Superfund designation,

Missoula
BLACKFOOT RIVER
Milltown State Park
Clinton
UPPER CLARK FORK RIVER
Drummond
FLINT CREEK
LITTLE BLACKFOOT RIVER
Garrison
ROCK CREEK
Deer Lodge
GEORGETOWN LAKE
WARM SPRINGS CREEK
SILVER LAKE
Anaconda
SILVER BOW CREEK
Butte
Upper Clark Fork River Basin
The upper Clark Fork River Basin takes in dozens of tributaries, including Rock Creek, Flint Creek, and the Little Blackfoot River. The Clark Fork begins northwest of Butte where Warm Springs and Silver Bow Creeks meet. The river flows mostly northwest and is paralleled for much of its length by freeways or highways, making it one of Montana's most visible rivers. The best fishing is in the upper reaches around Warm Springs and below where Rock Creek comes in near Clinton. The Drummond-to-Rock Creek stretch overwarms and fills with algae in midsummer.
River basin area
FWP Fishing Access Site
MAP BY LUKE DURAN/MONTANA OUTDOORS
SOURCES: GOOGLE MAPS, DNRC, FWP

it took more than a decade of constant pressure from groups like Trout Unlimited and the Clark Fork Coalition—an alliance of citizens, businesses, and organizations that initiated an aggressive "Remove the Dam, Restore the River" public campaign—before cleanup began. All the toxic sediment behind the dam—roughly seven million cubic yards, or about 500,000 dump trucks full—was finally removed by the Environmental Protection Agency and the state starting in 2006 after the reservoir was drained. The dam itself came down in 2008-09.

Restoration money comes from the Montana Department of Justice's Natural Resource Damage Program, which oversees the $320 million the state received in a legal settlement from ARCO to compensate for lands and waters damaged by historic mining and smelting.

In the upper Clark Fork headwaters, the Montana Department of Environmental Quality and the federal Environmental Protection Agency coordinated the removal of another one million cubic yards of contaminants from the banks and floodplain of Silver Bow Creek.

> **"It'll take a while for the Clark Fork to become what it could be, but I really think it will happen in my lifetime."**

A "NEW" RIVER

The ecological disaster afflicting the upper Clark Fork had a silver lining: It created a fisheries restoration opportunity unlike any in the state's history. "We had an opportunity to get a whole new river," Saffel says. "That's something you just don't see in this business."

The same with tributaries. Today Silver Bow produces fish like it hasn't since the late 1800s, creating hope that the mainstem upper Clark Fork can experience a similar recovery. Biologists found westslope cutthroats in Silver Bow in 2007; the tiny population had survived over the decades in a remote tributary of the creek. Ironically, Silver Bow had for decades served as a "chemical fish barrier" that prevented upstream migration of non-native rainbows and brown trout from the Clark Fork. Though some rainbows made it past to hybridize with native fish, the genetic quality of the Silver Bow cutthroat population remained (and still remains) high. When Silver Bow's toxic waters were cleaned, some of those cutthroat swam down and established a new population in Silver Bow. "Silver Bow Creek went from nothing to something," Saffel says. "Recently, one of our wardens busted someone for poaching a whole stringer of cutthroat from Silver Bow. That really shows

A RIVER FREED Clockwise from top left: Looking north, Milltown Dam in 2005 before removal at the confluence of the Blackfoot (center of photo, below the bridge) and the Clark Fork; the dam spillway that blocked fish movement for more than a century; the Clark Fork flowing free after the dam was removed in 2008-09; following sediment removal, rechannelling, and native vegetation planting, Milltown State Park now sits where the reservoir once was.

CLOCKWISE FROM LEFT: RYAN BRENNECKE; LARRY DEARS; LARRY DEARS; JEFF ERICKSON

how much that stream has recovered."

Saffel says a newly constructed fish barrier will block rainbows from swimming up from the Clark Fork and mixing with the natives. Eventually, biologists and trout conservationists hope that cutthroats will swim downstream over the structure and repopulate the upper Clark Fork with native stock.

Meanwhile, fish are once again moving up and down both the Blackfoot and Clark Fork. When Schmetterling followed trout in the 1990s, he found that the fish, when transported around the dam, traveled up to 100 miles in the Clark Fork watershed. With the dam now gone, trout are finally free to migrate as nature intended. "A cutthroat might spend the winter down by St. Regis [near the Idaho border] and then go all the way up into the North Fork of the Blackfoot or Monture Creek to spawn," Schmetterling says. "Now the whole watershed is available."

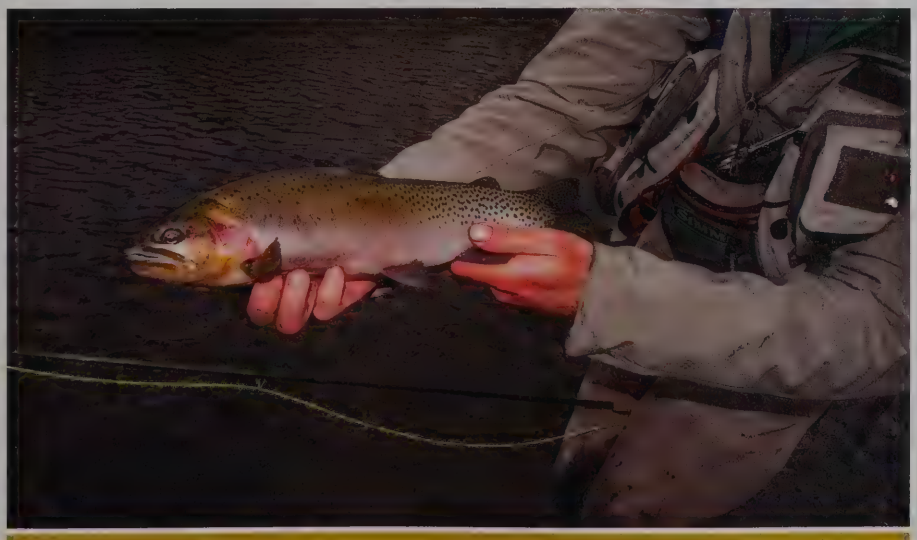
Other species also have benefited from the barrier removal. Bull trout in the lower river can now reach historic habitat on the upper Clark Fork, and especially on higher quality spawning waters of the Blackfoot and its tributaries. Even bottom-feeding suckers, a critical component of a river ecosystem, are seeing a resurgence.

OPTIMISM AMID CHALLENGES

Despite positive signs, the upper Clark Fork still has a long way to go before anyone can call it recovered. So far, anglers have noticed only minor changes to the fishery. "Anglers have been reporting a few more rainbows and cutthroats, especially between Drummond and Rock Creek, but the fishery is still almost entirely brown trout," says Brad Liermann, FWP fisheries biologist in Clinton. He and his colleagues point to four main challenges: toxins still in the water, irrigation barriers that block fish movement, excess nutrients, and lack of abundant cold water.

On Silver Bow and for miles down the upper Clark Fork, bankside tailings that over the years washed down from floods continue to leach toxins into the water. Cleanup happens slowly, and there's little that biologists and conservation groups can do to speed it up. Most fisheries restoration work in the upper Clark Fork focuses on removing smaller barriers to trout movement, such as irrigation dams, throughout the river system. (See "Restoring the tributaries," page 28.)

Another challenge is excess nutrients—phosphorous and nitrogen—that create massive algae blooms every summer from Flint Creek downstream to Rock Creek. "We have our lowest fish numbers here, and we believe it may be tied to the high algae density," Liermann says. "We're hoping that more research will help us understand how the two are connected." Students from the University of Montana and FWP biologists are working to find out where the nutrients originate—are they natural, human caused, or both?—and suggest ways to reduce the loads.



CUTTIE COMEBACK A fat westslope cutthroat trout recently caught on Silver Bow Creek.

PHOTOS: JOSH BERGAN

August caddis hatch on the Clark Fork near Galen.

Fishing the upper Clark Fork

By no means does the upper Clark Fork rank among Montana's premier trout waters. But the river is definitely fishable and can produce some large trout. Fish numbers are relatively low, but so is competition, which results in decent catch rates.

The river is almost entirely a brown trout fishery upstream from Drummond, say FWP biologists. From Rock Creek to Missoula, increasing numbers of rainbows and westslope cutthroats have appeared since Milltown Dam was removed.

Starting at the Clark Fork's uppermost reaches, Silver Bow Creek provides decent fishing for westslope cutthroat and brook trout, says KynsLee Scott, a guide for Blackfoot River Outfitters in Missoula. The challenge is access, because almost all of the stream runs through private land. "Find a bridge and fish up or down, staying in the channel," she advises.

The first hot spot moving downstream is the water below the Warm Springs ponds. Especially popular in winter and early spring, it "fishes like a spring creek," Scott says. Zebra midges, scuds, wire worms, and tiny mayfly nymphs all work well. The water here has excellent public access and a designated parking area.

In his book *Montana's Best Fly Fishing*, author Ben Romans touts the Deer Lodge-to-Drummond stretch for its Skwala stonefly hatch in April. There's also a decent caddis hatch in early May, he writes.

Between Drummond and Rock Creek, a mix of cattle yard runoff and other factors create algae blooms that massively depress fish populations. But below where the cold, clean waters of Rock Creek come in, trout numbers increase and insect hatches intensify. "Schwartz Creek to Turah is a popular float once the floating season winds down after June 30 on Rock Creek," Romans writes. "I like this section [of the upper Clark Fork] because the braids, undercut banks, and overall character are similar to lower Rock Creek."

—*Ed.*

Warm water is another issue. Bull trout need icy cold streams. Jason Lindstrom, FWP fisheries biologist in Anaconda, points out that the upper Clark Fork is in the southern part of the species' historic range. "So even a few degrees of warming can make or break bull trout in that marginal habitat," he says. "Climate change is not helping." The Montana Natural Resource Damage Program has allocated roughly $20 million for an aquatic restoration plan aimed at finding more cold, clean water for the upper river. Unfortunately, Lindstrom says, "the challenge is that there aren't many sources for that kind of water. Water stored in Silver Lake [upper Warm Springs Creek watershed] offers the best hope for bringing more cold, clean water into the upper Clark Fork."

Despite the challenges, FWP biologists and trout conservation advocates remain optimistic about the Clark Fork's future. "Removal of the dam was such a huge accomplishment," Saffel says. "Then you add all the contaminated soil removal at the dam site and along Silver Bow. It'll take a while for the Clark Fork to become what it could be, but I really think it will happen in my lifetime."

That's a nice notion to ponder. But during my afternoon on the Clark Fork, such daydreaming will have to wait. I've switched to stripping a streamer through the deep bends of the river, hoping I might change my luck. I cast again and again, but nothing. Then, just as I'm about to call it a day, a fish hits. It catches me off guard, but for perhaps a minute I can feel the big fish, deep in the hole, thrashing. I picture something savage and strong. I barely have enough time to shout and lift the rod some more and it's gone.

In the aftermath of the adrenaline rush, I sit down and wonder if it was a big brown or a bull trout. All other thoughts have abandoned me. Now I'm just thinking about that trout, deep down there in its river. I never like losing a fish, especially a big one. But it gives me comfort to know that it, and many more like it, now have an undammed and increasingly healthier river to live in.

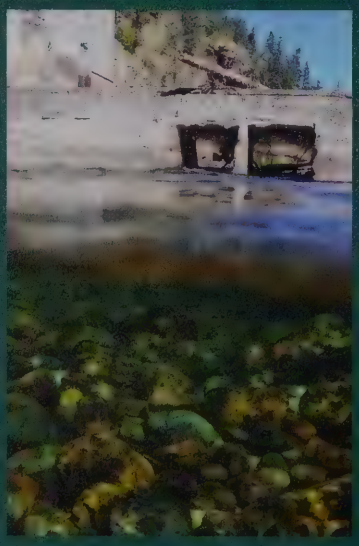
Restoring the tributaries

Trout Unlimited (TU), the Clark Fork Coalition, FWP biologists, and others are working with local ranchers to restore fish passage in the headwaters of the Little Blackfoot, an important tributary to the upper Clark Fork. Barriers such as culverts, irrigation diversions, and lack of water flow prevent trout from spawning, migrating, and gaining access to cold water refuges. Casey Hackathorn, who manages TU's Upper Clark Fork Restoration Program, says the partners are working with ranchers to modernize irrigation systems to eliminate impediments to fish movement while improving water use efficiency. "We want to overlay their needs with what trout need to have a win-win," Hackathorn says.

TU and FWP crews monitor the Little Blackfoot River

The City of Missoula and TU also plan to remove a lowhead dam on Rattlesnake Creek in 2019. Other streams scheduled for blockage removals include Racetrack Creek near Deer Lodge and Flint Creek near Drummond. "Our goal, which we think is reasonable, is to get the Clark Fork fish population up from the current 150 fish per mile to 1,000 fish per mile from Butte to Milltown," says Hackathorn. "We're working on the tributaries to reconnect and restore the fish factories that supply the young fish for the Clark Fork."

The Clark Fork Coalition is focusing on restoring tributaries such as Dry Cottonwood Creek and Modesty Creek between Butte and Deer Lodge as part of its Eight Gr8 Trout Streams project. Will McDowell, the coalition's restoration director, says crews are reconnecting chronically dry creeks by restoring flow. This opens spawning pathways, lowers water temperatures, and improves water quality. "We're also working on improving riparian habitat damaged by waste from abandoned mines, sediment, and lack of vegetative cover along the banks," he says.



Left: This dam on Rattlesnake Creek near Missoula is slated for removal in 2019. Right: willow plantings at Modesty Creek, a tributary reconnected to the Clark Fork after 60 years.

Milltown State Park

For decades, the site of Montana's newest state park, Milltown, was an underwater wasteland of toxic-laced sediment. Today the park sparkles with life, as hikers, mountain bikers, bird watchers, picnickers, anglers, history buffs, and others explore its 625 acres of floodplain, river, and forested bluffs.

The park was established at one of Montana's oldest and most historic rendezvous sites, where the Clark Fork and Blackfoot Rivers meet, just upstream from the old Milltown Dam site. Members of American Indian tribes like the Salish, Nez Perce, and Kootenai paused here as they traveled up and down the Blackfoot River on the famed "Road to the Buffalo," or while following the Clark Fork. The local Salish and Kalispel who came here to fish and trade called the site where the blue waters of the Blackfoot meet the greenish waters of the Clark Fork, *Ṇaayccstm*, or "Place of Bull Trout."

Explorers like Meriwether Lewis passed through, too. Travel intensified after 1860, when the Mullan Road was built. It carried soldiers, travelers, and cargo between the Missouri River at Fort Benton and the Columbia River via the Little Blackfoot and Clark Fork Rivers. The route was eventually followed by the Northern Pacific Railroad.

In January 1908, when Milltown Dam was finished, much of today's state park was flooded beneath a reservoir. Now, a decade after that dam's removal, the site has come full circle. Dovetailed with the dam removal and river restoration was a community-led redevelopment effort that crafted the conceptual plan for the new state park. The 2018 grand opening of the park's Confluence Area was a "culmination of a community vision that began 15 years earlier," says Michael Kustudia, park manager.

The park's main entrance is at the Milltown State Park Overlook, off Deer Creek Road on the river's west side. There visitors can view the valley below and fully appreciate the river's rebirth. The park provides opportunities to learn about the area's geological and human history. Visitors can also picnic, fish, watch birds and other wildlife, or carry a canoe or kayak to the water and float to Missoula. Nearly three miles of trails run between the bluff and the restored floodplain, planted with native vegetation.

For more information on the park, including a trail map and directions, visit the park's website at stateparks.mt.gov/milltown.

Kustudia attributes the park's success to a partnership among FWP, the Milltown Superfund Redevelopment Working Group, the Montana Natural Resource Damage Program, the U.S. Department of Housing and Urban Development, the U.S. Environmental Protection Agency, Humanities Montana, Missoula County, and the Montana State Parks Foundation.

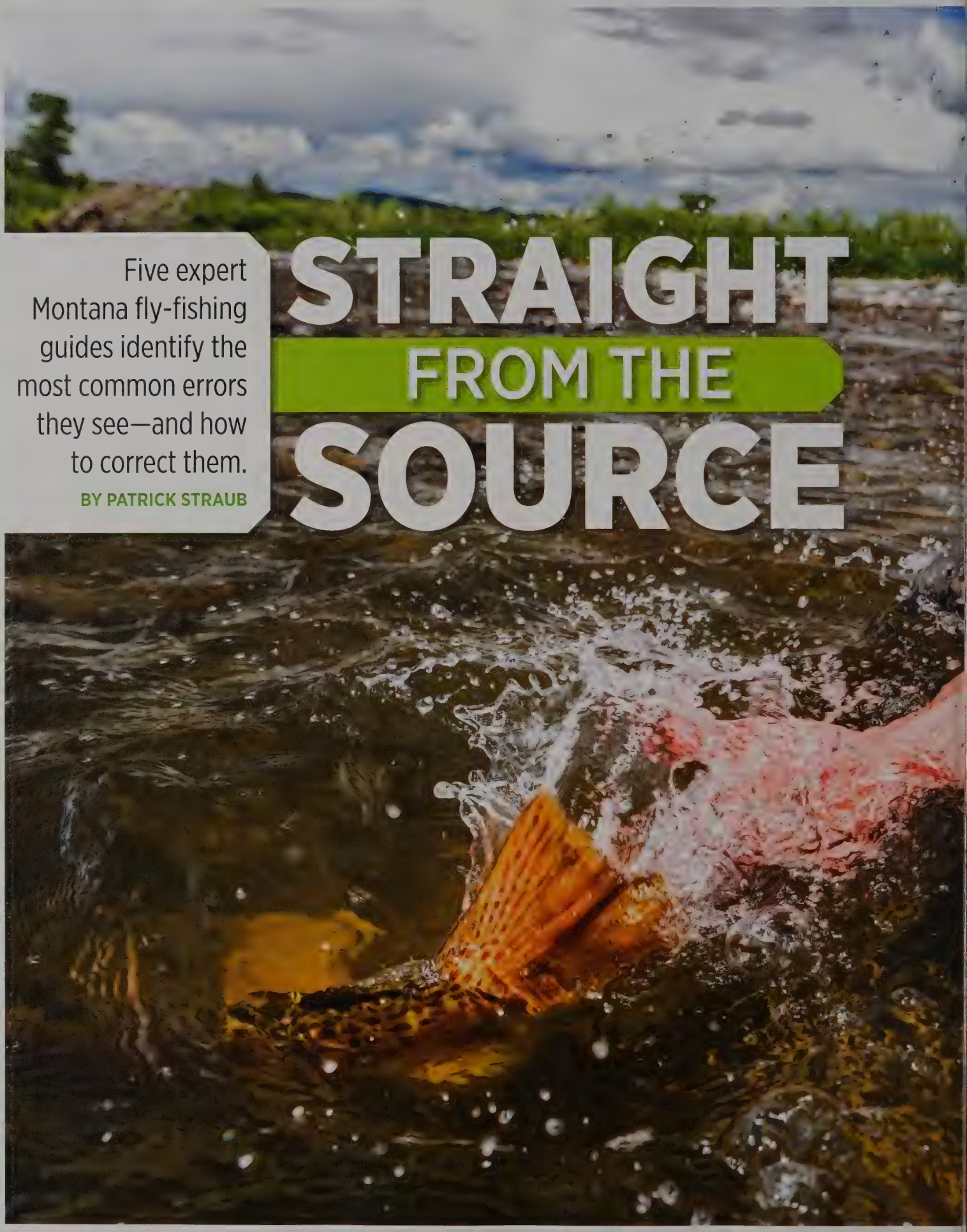
Other partners include the Missoula County Water Quality District, Clark Fork Coalition, Clark Fork River Technical Assistance Committee, Friends of Two Rivers, Five Valleys Land Trust, the Idaho-Montana Chapter of American Society of Landscape Architects, the Confederated Salish & Kootenai Tribes, Séliš-Q'lispé Culture Committee, and the Rivers, Trails & Conservation Assistance Program of the National Park Service. ■

TOP TO BOTTOM: STEVE AKRE; JEFF ERICKSON

STRAIGHT FROM THE SOURCE

Five expert Montana fly-fishing guides identify the most common errors they see—and how to correct them.

BY PATRICK STRAUB



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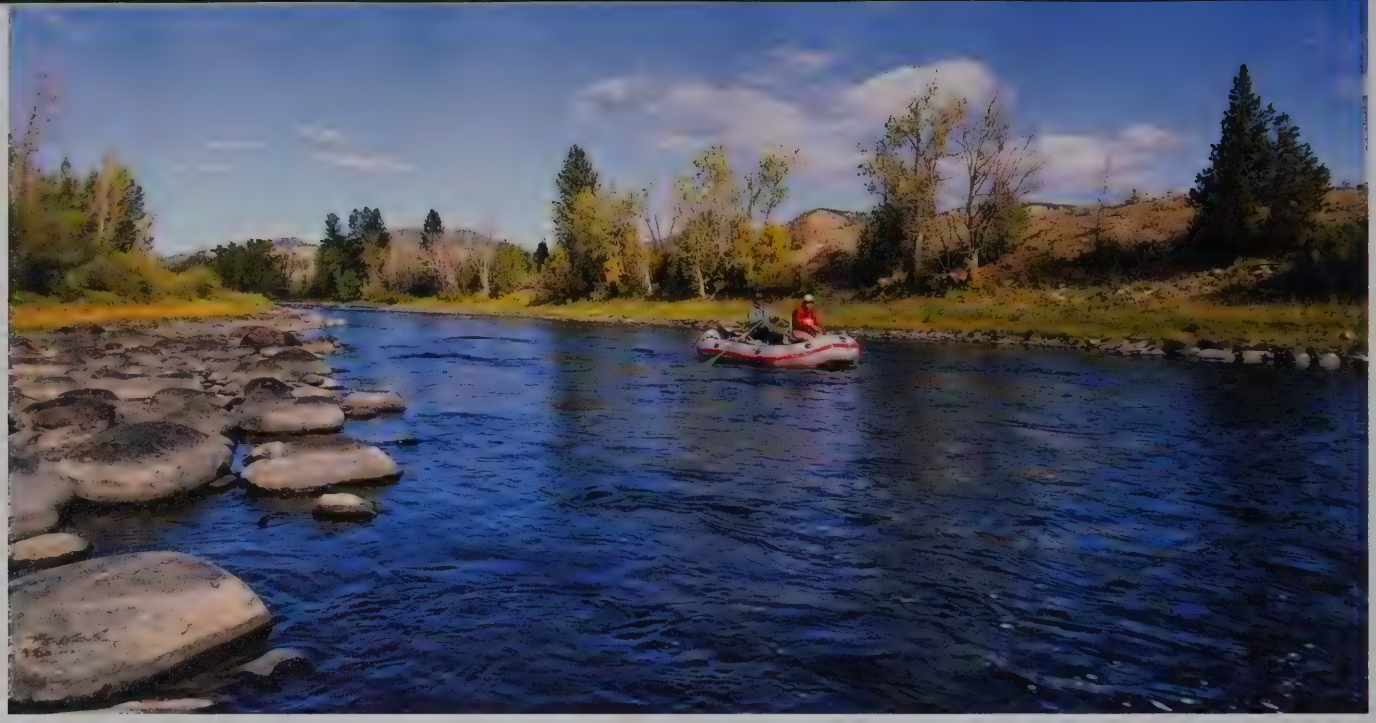

Fly-fishing is often a solitary affair. An angler, alone on the water, hopes to convince another living being to eat fake food made of feathers or yarn. But it also can be a social activity, where a pair or a group of anglers fish together and share in each other's successes and failures. Most fly-anglers are also more than willing to share their knowledge, especially with beginners. Fly-fishing books are invaluable, from technical manuals by experts like Gary LaFontaine, Lefty Kreh, Mike Lawson, and Rene Harrop, to the literary works of Thomas McGuane, David James Duncan, Jim Harrison, and John Gierach. Also helpful are fly-fishing videos and one-on-one instruction from experienced teachers.

In the spirit of the sport's educational tradition, I recently interviewed five Montana fly-fishing experts who were all willing to share the most important things they've learned from watching thousands of clients over the years. ▸▸

Author of *The Orvis Pocket Guide to Streamer Fishing*, *The Frugal Fly Fisherman*, and other fly-fishing books, Patrick Straub owns the Montana Fishing Guide School. He lives near Bozeman.

TOP TO BOTTOM BARRY & CATHY BECK, LON E. LAUBER

BRANT OSWALD
Owner, Brant Oswald Fly Fishing Services, Livingston
Home waters: Paradise Valley spring creeks and the Yellowstone River

Q: *Brant, you've been fly-fishing and guiding for more than 30 years. What are your top tips for people who are wade fishing?*
A: One, move slowly. Sudden movement spooks wary fish every time.

Two, stay low. Crouch, kneel, or even sit when casting. Learn to cast accurately from all three positions.

Three, wade slowly. In slow currents or still water, try to avoid pushing a wake in front of you. In faster water, move slowly enough so your feet aren't knocking rocks together. Sound travels very efficiently underwater.

Four, when approaching a piece of water, "Look before you leap." Even if the "bucket" seems obvious, don't go crashing into the water to get to it; take time to look things over. You may spot a fish in a place you didn't expect or observe feeding activity you hadn't noticed.

And finally, pay attention to shallows. Fish often move out of deeper water to feed in shallower lies during hatch activity, especially on tailwaters and spring creeks.

Brant Oswald

Q: *What do you tell people who are coming out to fish with you or planning a trip?*
A: If you plan to use your own tackle and equipment, double-check all your gear beforehand to make sure it's in good shape. Consider taking everything to your local fly shop (or a destination shop when you get to Montana) to check lines for wear, ensure backing and leader connections are in good shape, see that reels are oiled, etc. And check your waders, boots, and rain gear. Guides carry backup tackle, but don't expect them to have replacements for your leaky waders, broken laces, or left-behind raincoat.

Q: *You teach casting at several guide schools and casting events. What's the most common problem you see?*
A: Tailing loops. That's when the top and bottom parts of the unrolling loop of fly line cross one another in midair. Tailing loops

Tailing loops kill accuracy, and the resulting wind knots weaken your leader and tippet.

kill accuracy, and the resulting wind knots weaken your leader and tippet. They also require you or your guide to spend too much time untangling leaders and retying knots. Most tailing loops are caused by the rod tip dipping during the forward cast instead of moving in a straight-line path. Hire an instructor and invest the practice time to minimize tailing loops.

MARK RAISLER
Co-owner of Headhunters Fly Shop in Craig
Home water: Missouri River

Q: *Mark, on your fly shop's daily updated online fishing report, you constantly stress the importance of mending when nymphing. What is mending, and why is it so important?*

Mark Raisler

A: Mending is the act of repositioning your fly line and leader so that the fly drifts with, rather than contrary to, the current. It requires either adding more fly line near the bobber, or taking line away. The most important part of the mend is where the leader is near the bobber, and that requires using the whole rod to move the entire line and leader, not just moving the rod tip a couple of inches. Go big when mending a nymph line.

Q: *On the Missouri, most casts to rising fish are from upstream of the trout, working the fly down the feeding lane. You advise anglers to make that first cast count and commonly point out that, when an angler is targeting a rising fish, "This is not a time to practice casting."*
A: The first cast a fish sees is the most important one. On a heavily fished river like the Missouri, landing your fly on the fish's head will spook it. If you have to make practice drifts, do it a foot or two to the side of the trout's feeding lane. Then, when you are ready, present the fly into the feeding lane.

Q: *What's the one piece of gear I should update the most?*
A: Your fly line is the most important piece of the equipment puzzle. Change your line after every couple hundred hours of fishing. And keep your fly line clean. Slippery lines shoot better and float better. Most fly shops sell a 99-cent fly line cleaning towelette that will change your day. It's the best dollar you can spend. People will shell out $1,000 for a fly

TOP TO BOTTOM: MARK RAISLER; BRANT OSWALD

rod but then not take care of their fly line.

Q: *You see a lot of people in your boat. What do you find yourself repeating at the end of the day more often than not?*
A: Practice your cast. Practice for 10 to 20 minutes a week, because muscle memory is huge in this sport. But if you get tired when practicing, stop and take a break. Bad habits creep into your game when you are tired.

DAN "ROOSTER" LEAVENS
Owner, Stonefly Inn & Outfitters, Twin Bridges
Home waters: Madison, Big Hole, and Beaverhead Rivers

Q: *Rooster, you've traveled the world to fly-fish, spending roughly 250 days on the water each year. What have you found to be the most important part of fly-fishing?*
A: Being able to cast well—far, close in, and into the wind. And for goodness sake, anglers need to slow down their cast. Too many are impatient and hurry the forward cast.

Dan "Rooster" Leavens

Pause on your backcast. That's the single most important piece of advice I can give.

Q: *How does an angler learn to cast well?*
A: Like anything, with practice. The more you practice, the better your accuracy. When I was a kid, I used to cast on my lawn for hours. Before they come out to fish with me, I tell my clients to practice every day during their lunch break in the city park.

Q: *What's another error you commonly see?*
A: Casting too much over rising trout. Your first cast or your first drift is your best chance of hooking a fish. Make it count. A perfect drift on cast number seven is about as useful as a shovel with a hole in it. The fish have already seen your fly six times and have told you they aren't interested.

> A perfect drift on cast number seven is about as useful as a shovel with a hole in it.

Q: *Will "hot new" fly patterns help anglers catch more fish?*
A: Not if those patterns aren't presented correctly. I think it's better to use the tried-and-true patterns, and fish them well. A Prince nymph on a drag-free drift will always outfish some hot new nymph that gets dragged through the current.

Q: *Any last tips?*
A: Stealth. Whenever you are on the water, observe, tiptoe, and sneak around. And don't forget the classic olive Woolly Bugger. It should be in every angler's box, because it works in every water I've ever fished.

KELLY HARRISON
Lead instructor at Montana Women's Fly Fishing School and a guide for Grizzly Hackle Fly Shop, Missoula
Home waters: Bitterroot, Blackfoot, and Clark Fork Rivers

Q: *Kelly, you guide on a huge variety of waters. What piece of advice works everywhere?*
A: When a fish eats your fly, you need to commit to a strong hook set. A weak set can cost you a fish, even several moments into a fight or right as you are trying to net it.

Kelly Harrison

Q: *Do you fish year round?*
A: Absolutely. To get good, you must be willing to fish even during the cold months. And a bonus is that the off season is when there's less traffic on the rivers. But to do that, you must have good gear that keeps you dry and warm, not wind-whipped and frozen. And the same holds true in the heat of summer. Use clothing and headgear with sun protection, and always wear sunblock.

Q: *What could all anglers do to improve?*
A: One, learn what is too much or too little slack in your line when it's on the water. Too little can cause the fly to drag, and too much can cost you a hook set. Two, you have to present the fly so it looks real. A lot of times the exact fly pattern doesn't matter as much as how you're fishing it.

Q: *You're one of the few Montana fishing guides who actually grew up here. What do you want*

> All of us should feel an obligation to keep our environment clean and healthy.

TOP TO BOTTOM: KELLY HARRISON; DAN LEAVENS

for the future of fishing in Montana?
A: I want anglers to take responsibility for their local rivers. If you see trash, line, hooks, or whatever, pick it up. All of us should feel an obligation to keep our environment clean and healthy.

JOHN SINDLAND
Longtime guide for Bighorn Angler, Fort Smith
Home water: Bighorn River

Q: *John, the Bighorn can see hundreds of anglers in a day. How do you deal with the feeling of being crowded?*
A: I think the key is to be respectful of other anglers by giving them the space and time they need to enjoy the experience—and hopefully they will do the same in return.

Q: *What are some things that anglers can do to show respect to other anglers?*
A: Politely communicate. For instance, when you approach another boat, ask to find out where they plan to fish, and then adjust your plan accordingly. Something as simple as, "Hello. How's the fishing? Are you planning to fish upstream or downstream?"

Also, don't be a "hole hog" and fish the same spot for hours. On the Bighorn, I've seen guys hike in and set up a tent next to a good hole so they can fish it all day. At a fishing access site, be sure not to block the ramp. Load your gear away from the ramp. And when you return, quickly get your boat out of the water and off the ramp before you start removing gear so other anglers can use it.

Q: *On a river like the Bighorn that has lots of trout but also lots of anglers, what advice can you give to help anglers in those situations?*
A: Be observant. Look for subtle rise forms, pushes, and movements in the water column. Fish the nooks and crannies, and try fishing the areas that aren't as popular or well-known. I have had some very good days fishing areas that don't receive as much pressure as the so-called hot spots.

John Sindland

TOP TO BOTTOM: JOHN SINDLAND; ED COYLE

Working the Walleye Factory

Fresno produces more of these delicious fish per acre than any other reservoir in Montana. Here's how to put some in your cooler. By Tom Dickson

On a warm evening in mid-May, Montana Fish, Wildlife & Parks fisheries biologist Cody Nagel and I drive past grasslands and wheat fields until we reach Fresno Reservoir, a Milk River impoundment that flows into Hill County from Canada. After rigging our spinning rods with small leadhead jigs tipped with rubber minnow look-alikes—live minnows aren't allowed in the reservoir—we wade into the shallows of a quiet bay and begin casting. Other than the faint "plop" of the jigs hitting the water, the only other sounds are the distant hum of a powerboat and the cooing of mourning doves flying in and out of cottonwood stands lining the shore.

Located 14 miles west of Havre on the Hi-Line and owned and operated by the Bureau of Reclamation (BOR), Fresno was built in 1939 to supply water for irrigation and municipalities and to control flooding. The 5,700-acre impoundment also provides opportunities for boating and fishing.

Though Fresno produces northern pike, yellow perch, black crappies, and lake whitefish, most anglers seek the reservoir's numerous walleye. "It's a walleye factory," Nagel says. He explains that the Milk River, flowing through the fertile farmlands of southern Alberta, supplies the reservoir with nutrients that fuel production of zooplankton and invertebrates that young walleye eat. The addition of Fresno's abundant walleye spawning and rearing habitats and cool but not cold water for adults in summer creates "ideal conditions for strong natural reproduction," Nagel says.

Since 2014, FWP fall netting surveys have averaged 16.4 *Sander vitreus,* or walleye, per net, the highest abundance in the state. Anglers target this close cousin to the yellow perch and sauger for its white, bone-free fillets. Nagel says catch rates from late April through June are 0.5 to 0.7 fish per hour. In other words, on average, an angler who fishes there for four hours catches two or three walleye.

That's twice the state average. Limits of five walleye are common, even from shore. Most of the fish tend to be "eaters," three-year-old fish in the 14- to 16-inch range.

TYPICAL An angler and his son show off a typical Fresno "eater"-size walleye.

ABUNDANT BUT NOT BIG

That's Fresno's good news. The bad news, at least for some anglers, is that these prairie walleye don't grow as big as those in Canyon Ferry, Tiber, and Fort Peck Reservoirs. It's an ecosystem issue. Nagel explains that as abundant young walleye grow, they need to eat bigger food—ideally, 5- to 10-inch perch or crappies—to reach the 25-inch-plus size that anglers consider trophies. "Fresno just can't grow the number of perch and crappies needed to provide a larger forage option," he

TOP TO BOTTOM: ERIC ENGBRETSON; ERIC/ENG WALLPAPER

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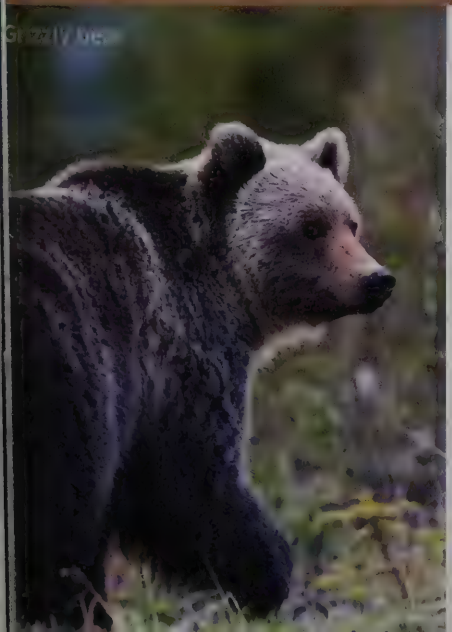

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says. That's because the reservoir's abundant midsize walleye eat up almost all of the forage fish before the perch and crappies grow large enough to feed larger walleye. What's more, the reservoir has relatively few suckers and other forage species that fatten walleye in other reservoirs. Cisco, an oily salmonid that produces big walleye (including the state record) on the much deeper Tiber, about 85 miles to the west, can't survive in the relatively shallow Fresno.

Stocking additional young walleye, a management strategy used on some other reservoirs with different ecological conditions, wouldn't work on Fresno. "You need the right balance between forage and predator fish species to achieve a long-term sustainable walleye population and size structure," Nagel says. "Hatchery fish would disrupt that by adding more pressure on the limited forage base. It would end up reducing the average walleye size because there'd be that many more mouths to feed."

WATER UP, WATER DOWN

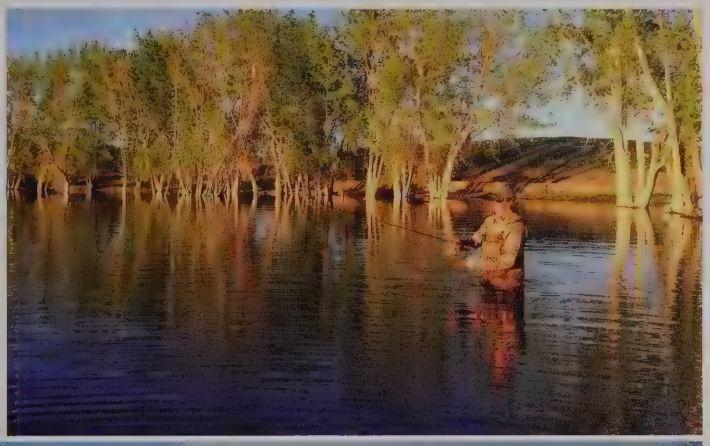
The reservoir's yo-yoing water levels pose another fisheries management challenge. Some Montana reservoirs, such as Nelson near Malta, are off-site storage impoundments where water levels remain relatively steady, as in a natural lake. But Fresno is a "flow-through" reservoir, meaning the river runs to, through, and out of the impoundment. That increases water fluctuations. Nagel says Fresno rises and drops as much as 20 feet in a given year as the BOR holds water from spring runoff, then releases it during summer to downstream irrigators. "When water levels drop, you lose a lot of the rock and vegetation habitat in the shallows that young-of-the-year fish need to avoid predators," Nagel says.

Fresno's game fish reproduce best when the reservoir has high and stable water levels during April spawning. "That allows walleye, northern pike, and yellow perch to use the submerged rock, gravel, and vegetation for spawning. Then the young-of-the-year fish can hide out in that shallow-water habitat, producing a strong year class," Nagel says. "If the water stays high through June, we also can see some great crappie reproduction."

High water comes with a cost, however. "We lose many adult fish that flush over the spillway during extremely high reservoir levels," Nagel says.

CHAPTER MEMBERS CHIP IN

FWP and local anglers have no control over Fresno water levels and how that affects the walleye population. But they can improve



IN CLOSE Right: FWP fisheries biologist Cody Nagel casts a small jig into Fresno's waist-deep waters late one May evening. Below: Though boaters regularly crisscross the 5,700-acre reservoir, most of the best walleye fishing is found close to shore.

TOP TO BOTTOM: TOM DICKSON; JOHN WARNER

ACTIVE Left: Members of the Walleyes Unlimited Fresno Chapter with trees they haul onto the frozen reservoir to create perch habitat. Right: In summer, chapter members take local kids fishing and sponsor a youth fishing tournament.

recreational amenities at the reservoir. Nate Molstad, president of the Walleyes Unlimited Fresno Chapter, says group members have installed fishing docks, repaired aging boat ramps, built a campground and pavilion, donated picnic tables, and paid for laying gravel on roads. "We try to tackle about anything that anglers need out there," he says. Members raise funds with a local banquet that attracts 400 to 450 people each April, followed by a month-long raffle of hunting rifles and shotguns. The chapter also holds an annual youth education day, a kids' fishing tournament, and the Fresno Challenge, which is part of the Montana walleye tournament circuit. Molstad adds that each winter group members work with FWP crews to drag old Christmas trees onto the frozen reservoir; the woody debris sinks with ice-out and provides habitat for perch, a key forage species for walleye.

SHORE FISHING

Not only can anglers catch abundant walleye at Fresno, they can do it from shore throughout much of the open-water season. Catching fish from shore is possible on most walleye reservoirs for a few weeks in spring and fall, when fish cruise the shallows to feed. But walleye typically head to deeper, cooler water in midsummer to chase cold-water forage fish such as cisco. That puts them out of reach for anglers without a boat.

That's not the case at Fresno. Nagel says most of the reservoir's underwater fish-holding structure is part of the ledge rock that runs along the shoreline. Forage species such as perch, emerald shiners, and spottail shiners hang out in the rocky shallows. "The middle of the reservoir is just a big mud sink, with little structure," he says. "Walleye stage there throughout most of the day, but then they come close to shore during the low-light periods of early morning and evening to feed."

Most anglers fish from boats, Nagel says, but they often cruise the shallows, casting or trolling near shore. "Usually it can be just as productive wade-fishing Fresno from shore as fishing from a boat," he says. "Once I figure out where the fish are located, I can catch them from shore all summer long."

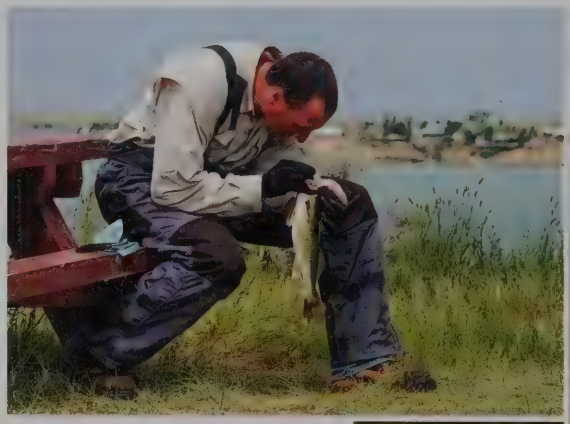
NOT TONIGHT

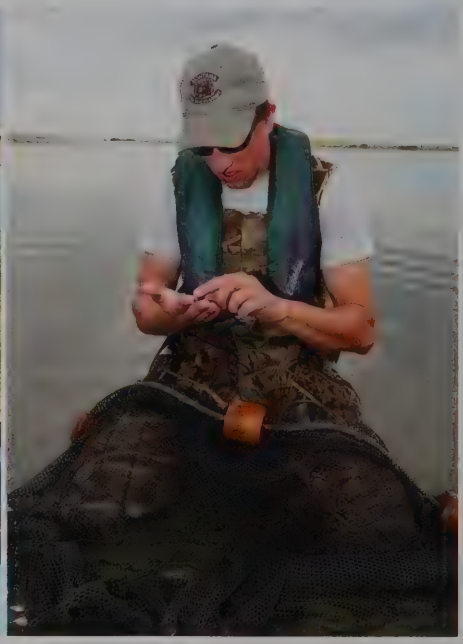
On this particular spring evening, I'm not having much luck. In two hours all I've caught are a few small northern pike. These hard-fighting fish are fun to catch and can be great to eat, but the "hammer handles" I hooked were too small to keep. Nagel points out that the area received four inches of rain during the previous two weeks, rapidly raising water levels and flooding the shoreline. "That will be good for forage fish production later this summer, but it's not so good for us tonight," he says. "The walleye could be anywhere, even over there in the flooded trees."

At nightfall, he and I don headlamps and tie on crankbaits. Annoyed by bright sunlight, walleye become less spooky and more aggressive after dark. Casting crankbaits allows us to cover more water than we could by jigging.

We each head in different directions along shore, wading slowly in waist-deep water while fan-casting in search of cruising fish. Two hours later, around 10 p.m., we meet back at Nagel's truck. He's caught one 15-inch walleye. I've come up blank. "Most nights between April and October, walleye bite well for 20 minutes to two hours between 7 and 10 p.m.," he says.

Most nights, but not this one. Still, I'll be back. I don't own a boat, and there aren't many places where I can catch a limit of walleye from shore. It'll take more than one fishless night to keep me away from this Hi-Line walleye factory.





INVESTIGATING Cody Nagel cuts open the head of a typical Fresno walleye to remove otoliths (near right) that he will later examine under a microscope to age the fish. Far right: Nagel checks young-of-the-year walleye numbers to see how a new generation is faring.

Fresno walleye through the year

Cody Nagel lives and breathes walleye. He grew up fishing for the glassy-eyed species in North Dakota, and today manages Montana's most productive walleye water. When he gets off work, Nagel goes walleye fishing—on his own, with his wife and kids, or with a buddy on the walleye tournament circuit. "It's nuts; I admit it," he says.

Here's how this self-described walleye fanatic fishes Fresno through the year:

The season begins in **late April** after ice-out, when fish move from deeper water to shallows to spawn along rocky reefs. Nagel fishes the upper reservoir with Flicker Shads, floating Rapalas, and other shallow-running crankbaits in perch or chartreuse colors.

The action heats up in **May and June** as warming water increases the fish's metabolism. That's when Nagel moves down-reservoir and fishes a ⅛-ounce leadhead jig tipped with half a night crawler or a rubber twister tail or paddle tail in two to ten feet of water. Live minnows are not allowed in Fresno.

Nagel says walleye swim almost anywhere along the lower reservoir that time of year. "No need to drive very far. I stay close to the campground," he says.

In summer, Nagel switches to a slightly heavier ¼-ounce jig and fishes a bit deeper, in 15 to 20 feet of water, focusing on underwater points where the water drops off quickly. Because walleye don't like bright sunlight, the best fishing starts in late afternoon when the sun is low and improves after sunset. If jigs don't produce, he switches to crankbaits, especially after dark.

A simple slip-bobber and worm or leech works, too. "I've caught limits from shore on July evenings while my kids are swimming nearby," he says.

The fishing usually peters out in **August through September,** when young-of-the-year perch and crappie are abundant and walleye prefer the real thing over anglers' artificial offerings. "Then in **October and November,** if you can stand the cold, things really pick up," Nagel says. "I fish at night right off the boat ramp with a lantern that attracts zooplankton. Forage fish come right in, with walleye right behind."

Fresno usually ices over by mid-November. Most years, the ice reaches a safe six to eight inches by **Christmas**—though you should always check depth by drilling holes before venturing too far out.

Most of the **ice fishing** happens within the main basin and bays, where anglers focus on the deeper water and steep ledges where winter walleye, crappies, and perch concentrate. Nagel says dead or frozen suckers, fished on tip-ups, seem to work best for walleye. Jigging spoons and jigging Rapalas can also produce.

"Some years, ice fishing for walleye on Fresno can be tough," he says. "I've had my best years when forage production was low and the walleye were hungrier than usual."

Many ice anglers have better luck catching northern pike or lake whitefish. "Whitefish don't get much attention," Nagel says. "Fresno has a good population of these great eating fish, and they average three to five pounds." ■

JUST CAN'T QUIT Nagel, his wife Dezerae, and son Brayden troll for walleye with shallow-running crankbaits. "We like the boat, but we mainly fish from shore," Nagel says. "We've caught a lot of limits while my son is right there playing in the water."

JOHN WARNER

Getting stoked on conservation

BY TOM DICKSON

Who will pay to manage and conserve fish and wildlife 25, 50, or 100 years from now?

For the past half century, anglers and hunters have funded most of that work. Money they spend on fishing and hunting licenses goes to state agencies like FWP to hire biologists, acquire and protect habitat, and monitor species and populations. Anglers and hunters also pony up through federal excise taxes on shooting, fishing, and boating gear. The money goes to state fish and wildlife projects.

The results of this arrangement, the North American Model of Fish and Wildlife Conservation, have been astounding. Populations of elk, pronghorn, deer, wild turkeys, and many fish species today far exceed what they were in the early 20th century. What's more, restoring these populations has required state and federal wildlife agencies to identify and safeguard critical habitats. Along with environmental laws protecting land and water, that work has restored and sustained wild places such as national wildlife refuges, state wildlife lands, federal wilderness areas, intracontinental migration routes, wild and scenic rivers, and blue ribbon trout streams.

But the North American Model has some shortcomings. A big one is that it's based on hunter and angler numbers at least keeping pace with overall population growth. That isn't happening. Even in a hunting and fishing-obsessed state like Montana, those numbers are slipping per capita. Elsewhere, the decline is alarming. State and federal agencies are working with industry and nonprofits to stem or even reverse that trend. But for now, the combination of fewer licenses sold and less hunting and fishing gear purchased means a declining revenue stream for management and conservation.

Meanwhile, participation in other outdoor sports is flying high. Mountain biking, hiking, kayaking, off-roading, camping, skiing, rock climbing, RVing, stand-up paddleboarding, and other activities have seen steady and in some cases explosive growth, according to the Outdoor Industry Association.

This new dynamic—fewer duck hunters but more trail runners—creates a challenge for traditional fish and wildlife conservationists. Can we instill in those other outdoor adventurers a conservation ethic resulting in conservation funding and advocacy? If so, what would be the process through which a mountain biker or kayaker pays to protect and manage trout streams and elk winter range? (Almost no state or federal tax dollars go to fish and wildlife conservation.)

Adding to the dilemma is the possibility that outdoor recreationists think they already do enough. That's the concern of Ethan Linck in a 2018 essay in *High Country News* ("Your Stoke Won't Save Us"). Linck maintains that many outdoor adventurists mistakenly believe their passion itself is an act of conservation. That just getting "stoked"—being enthusiastic or exhilarated—about bouldering, whitewater rafting, or backcountry skiing is an act of moral goodness that somehow helps land, water, and wildlife.

But stoke doesn't necessarily translate into caring about, much less fighting for, the natural resources that support outdoor recreation. Instead, it "centers on the self and the quality of human experience, and thus has no intrinsic stake in biodiversity or ecosystem stability," Linck writes.

In coming years, converting stoke into conservation funding and political action will challenge agencies like FWP. Kayaking and rock climbing don't need fish and wildlife. Even if every elk, deer, mountain goat, walleye, and trout disappeared overnight, a person could still Jet Ski, canoe, or mountain bike. Those activites might not be as much fun, but the absence of fish and wildlife wouldn't render them meaningless in the same way it would angling and hunting.

And if some members of the growing outdoor recreation community don't value wildlife and fish as much as hunters and anglers do, convincing them to pay to conserve and manage moose, sauger, and the places where those and other species live could be especially difficult.

One solution may be for agencies like FWP to help more people develop what sociologists call "place attachment": a sense of identity with and dependence on healthy local landscapes and the ways those places enrich our lives. This new perspective could produce "a different outdoor recreation culture, one that emphasizes the pleasure of knowing the wild that comes from daily practices that form bonds with places that are the backdrops to our lives," Linck writes.

In other words, we learn to view the natural world less as a playground and more as a home, or even a temple: a sacred place made of precious, irreplaceable materials. That perspective, in turn, would open hearts and wallets to help conserve and protect the places where wild things live and thrive.

Getting stoked about mountain biking, hunting, skiing, fly-fishing, or rock climbing produces a definite high. But knowing we are helping conserve the lands, waters, and wildlife that make those outdoor activities possible? That may be the best feeling of all.

Tom Dickson is editor of Montana Outdoors.

ILLUSTRATION BY STAN FELLOWS

Grasshopper sparrow

Ammodramus savannarum

By Heather Harris

DONALD M. JONES

Montana's many grassland passerine (songbird) species are beautiful to see, marvelous to watch, and wondrous to hear. Unfortunately, sometimes they are not considered worth a second glance and often get dismissed as "LBJs" ("little brown jobs").

It's true these birds are small and hard to tell apart. *The Sibley Guide to Birds* describes one sparrow species as having a "relatively plain face" and says it is "brown and tan with light streaking, but isn't as streaky as other sparrows and has an unstreaked buffy breast." That's not too helpful for most people. I can understand why these seemingly plain-looking species often are disregarded when compared with brightly colored bluebirds or melodic meadowlarks.

But grassland passerines are unique species with subtle but gorgeous markings, unique songs, and other traits. One of my favorites is the grasshopper sparrow.

IDENTIFICATION

Grasshopper sparrows are small birds that regularly flutter their wings while perched on grass stalks or barbed-wire fencing.

A grasshopper sparrow appears brown and indistinguishable from most other field sparrows. But closer examination reveals intricate patterns of rufous spots along its back and wings. It has a large, flat-crowned head, a short tail, and a larger bill than many similar-looking species. The relatively plain face is set off with a white eye ring and often is marked with small patches of yellow on the "lore" (the area between the eye and bill).

HABITAT

Grasshopper sparrows live throughout Montana in open grasslands, prairies, hayfields, and pastures. These small birds stay close to the ground and often walk or run rather than fly. Their stealthiness and nondescript plumage allow them to disappear into the prairie while they forage on the ground, unnoticed by predators.

Grasshopper sparrows fly south each October to winter in grasslands of the southern United States, Mexico, and western Central America.

VOICE

Because grasshopper sparrows breed in Montana, their mating calls can help with identification. They typically arrive here in late April and begin making their insectlike song: *tik tuk tikeeeeeeez*. The high-pitched buzz resembles that of a grasshopper, which accounts for the sparrow's name. To hear the call, do an online search for "grasshopper sparrow song." Once you learn its distinct call, the species becomes easy to identify.

SCIENTIFIC NAME

Ammodramus is from a Greek word meaning "sand runner," perhaps referring to the amount of time the various sparrow species in this genus spend hopping around on the ground. *Savannarum* is Latin for "grassland."

FOOD

Grasshopper sparrows mainly eat grasshoppers, beetles, caterpillars, and spiders. They are preyed upon by loggerhead shrikes, bull snakes, foxes, and various prairie raptors.

REPRODUCTION

Grasshopper sparrows nest on the ground in a small bowl of dry grass lined with finer grass, rootlets, and animal hair. The nest sits hidden at the base of a large clump of grass in a slight depression on the prairie. To further reduce unwanted attention from predators, the sparrows walk to and from their nest a short distance before taking flight.

Females incubate four or five creamy white eggs with reddish-brown spots for 11 to 12 days. Once the eggs hatch, both adults tend the nestlings. They capture insects for themselves and their young by first immobilizing each bug with a pinch behind its head and then vigorously shaking the legs off.

The young typically leave the nest nine days after hatching, before they can fly well. They depend on their superbly camouflaged plumage to blend into surroundings and escape predators' eyes.

Each year, grasshopper sparrows raise up to three clutches of eggs, running from May through July.

CONSERVATION

The grasshopper sparrow is common in Montana grasslands and other intact shortgrass prairies across the United States. But the continent-wide population is declining because of the loss and fragmentation of the bird's grassland habitat as it is converted to crop land, highways, and housing. According to the North American Breeding Bird Survey, the population declined by roughly 2.5 percent per year between 1966 and 2015.

Heather Harris is FWP's regional nongame wildlife biologist and furbearer specialist in Glasgow.

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I want their day at Montana WILD to last a lifetime. Or two, or three.

At FWP's Montana WILD education center, we help kids and adults gain a greater appreciation for all things wild. When people learn about state parks, wildlife, and fish, they value and conserve those resources so that someday their kids and grandkids can experience everything that wild Montana has to offer. My name is Ryan Schmaltz. And the outside is in me.

RYAN SCHMALTZ ★ MONTANA WILD EDUCATOR ★ HELENA

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